WITH METALLURGICAL SECTION

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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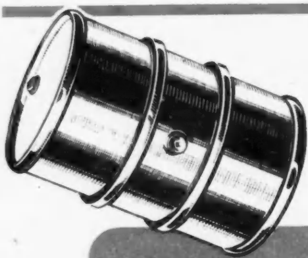

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Labour and Production

AMONG the facts that are common knowledge is the chronic shortage of everything that we need. It is difficult to find anything we desire to buy that is unrationed. If goods are not rationed officially, they are rationed by the shopkeeper who restricts his customers, or they are rationed by the producer who rations the shops by a "quota" out of which customers are served in rotation. If we ask why there is a shortage, we receive a variety of replies. The favourite one is that everything is being sold abroad. That is only a partial answer, however, because Sir Stafford Cripps, speaking in Edinburgh on September 19 last said that we are back to our pre-war level of exports—no more. Whether this means in value or in volume of goods we do not know, but we suspect it means in value, and therefore the volume of goods is considerably less. The labour force is not greatly less, however, because in the same speech Sir Stafford said that the number of workers available is about 20,000,000. Does the cause of the shortage lie in the decreased productivity of labour? Is the truth of the matter that the output per man-hour or per man-week is lower than it should be?

We are disposed to believe that a good deal of the shortage arises from that cause. In his speech, Sir Stafford Cripps said: "The most essential item of all (*i.e.*, for increased production) is good team work in factories. This can only come about if the workers are taken fully into consultation and are treated as intelligent partners rather than as brainless robots, as they have so often been treated in the past." We know beyond a peradventure that the technical staffs of factories and other production units are working as they have never worked before. Theirs not to strike or demand closed shops; theirs to burn the midnight oil. That being so, the only conclusion that we can draw from the reference to teamwork is that the workers are not pulling their weight. There is abroad in Britain a spirit of go-easy which is very disquieting, but which is to some extent the aftermath of the exertions made during the war. Until that spirit is exorcised and Britain turns again to work with a will, we shall not be prosperous, we shall not be able to afford to buy from abroad those things that we need to make life endurable.

Unfortunately, we are in a vicious circle that is difficult to break. While war tiredness may be part of the reason for the disinclination to work at full pitch, it is not the only reason. Technical men of all professions are intensely

On Other Pages

interested in their work, and to a large extent their work is their hobby. Whatever the conditions they will work hard because they cannot help it. For the hewers of wood and drawers of water the conditions are different. The great majority of people are not, like Becker's chemists, " impelled by an almost insane impulse to seek their pleasures among the soot and flame, poisons and poverty "; they labour because of the curse of Adam. If a man wants something badly enough he will work to get it. But when men see their earnings taken from them by the tax-gatherer, when they find that there is in the shops nothing upon which they can spend such money as is left to them, the will to work departs. The greatest fillip that could be given to this nation would be to provide the people with the goods that they want, and at the same time to reduce the level of taxation for all classes of the population—not the lower wage groups alone—so that the incentive to work may be restored. It is in our view the greatest argument against nationalisation and socialisation that they remove the incentive to work. The incentive that makes men work is ADVANCEMENT. Unless a boy or a man has the chance to " get on " in the world he will have little incentive to work hard. The reward that most men seek is wealth. Let us not delude ourselves about that. If it is rendered impossible for a man to grow rich, the incentive to enterprise is removed. The sturdy individualism of our fathers is being taken away from us; and nothing is being put in its place save the conception of a world wherein all are planed down to a dead level of income —and a low level, at that—with little or no hope of attaining a higher level by honest hard work.

Industry is a partnership between labour and capital. It is a partnership in which each has a part to play, but those parts are not interchangeable. We should like to have further information about what Sir Stafford Cripps means when he suggests that " team work can only come about if the workers are taken fully into consultation." It is obviously impracticable for factories to be run on the lines of a Soviet in which everyone has directly or through his representatives a say in the making of policy. The General does not consult his privates concerning military tactics; neither can the skilled business man be expected to consult upon questions of policy those who are inexperienced in the running of a business. On the other hand the relationship between all who are engaged in the work of any particular firm should be such that every man employed, from the highest to the lowest positions, regards the well-being of the firm as his particular care. The management should welcome suggestions on any subject, no matter from what quarter they emanate. Those who make these suggestions should be informed whether they have been accepted and if not for what reasons they have been rejected. The efforts of those who make suggestions should not go unrewarded. There are many directions in which the workman can be kept in touch with what is going on in the factory and can be given a hand in its organisation. The regulation of working conditions, safety measures, and many other things intimately concern everyone who is engaged in the works. If what we have said here is the meaning of Sir Stafford Cripps's reference to " consultation " we are entirely with him. Team work is essential for the running of any successful business, and suggestions received from experienced workmen as to how a job should be done, for example, must always be regarded with considerable respect.

Why is it that we are, in Sir Stafford's words, " gravely under-managed in most of our important consumer industries "? There is no doubt a disproportionate number engaged in certain trades, such as building, but we hardly think that accounts for the statement. The present shortages of goods are no doubt also due to the unfulfilled needs of the past few years. There have been notable increases in the rate of production. There is no doubt that when the present world hunger for goods of all sorts has been to a large extent assuaged, the present sellers' market will change to a buyers' market and we shall have to face competition. If production costs are too high then, we shall not sell our goods abroad. To lower production costs it is necessary to reduce taxation, to reduce labour charges, to reduce fuel costs, in short to operate our industries with a high degree of mechanisation and as efficiently as possible. In Sir Stafford Cripps's words: " Good quality of workmanship and design and reasonable prices will be needed if we are to maintain the volume of our exports." That is a call to technical men everywhere. It is necessary that we should now begin to plan against the time when the buyers' market will rule.

NOTES AND COMMENTS

The Heavy-Oil Subsidy

ON October 1 the subsidy of one penny a gallon on heavy oil comes into force, with the idea of continuing until the import duty at the same rate falls to be removed in next year's Finance Bill. This is an implementation of part of the recommendations made by the Ayre Committee last year, the full import of which we discussed at some length at the time (THE CHEMICAL AGE, 1945, *52*, 453). Since then the difficulty of the coal situation has been aggravated and the proportion of heavy oil used as fuel will be considerably increased as compared with that used for chemical synthesis. Indeed, annual consumption of fuel oil is expected to be more than doubled—say from about $1\frac{1}{4}$ million tons to 3 million tons. Nevertheless it is probably not altogether a coincidence that the formation of a new company to produce chemicals from petroleum should have been announced almost simultaneously. Matters have been "boiling-up" in that direction for some time now, and we have consistently advocated the extension of petroleum-cracking in this country. It may thus be that the final fillip has now been given to what may be an enormous and entirely new form of industrial development in Britain.

Soil Chemistry

WE have been reading with great pleasure, during the last few days, Dr. Dudley Stamp's book on *Britain's Structure and Scenery*, the latest addition to Collins's *New Naturalist* series. Apart from the fact that the book as a whole is a fascinating and thoughtful study of its subject, there is one section that must be of special interest to chemists, and that is the dozen or so pages concerned with soils. Naturally, in a book of this scope, the treatment is general, but there is a lot to be said for so clear and concise an exposition of the differences—physical and chemical—between soils, and the variation that they demand in treatment, from the point of view of utilisation. Dr. Stamp, it is well known, is deeply concerned with Land Utilisation, so that it is not surprising that he should show a thorough grasp of this subject; but we were particularly impressed by his views on the vexed question of "natural" against "artificial" fertilisers. He is not primarily a chemist, so that we were prepared for a little bias against "artificials." Happily, we were disappointed. Dr. Stamp adopts the attitude which we have always approved: that both natural and artificial fertilisers have their place, and that neither excludes the other. But, as he points out, what is a proper and excellent treatment for an English soil may be utter folly when applied, say, in West Africa. Britain has an amazing variety of soil within a very restricted area, and any generalisation is dangerous. For an exemplar of the scientific attitude to a highly complicated problem this chapter takes a lot of beating.

A Restoration Problem

WHILE on the subject of soil, it will not be out of place to call readers' attention to a small pamphlet issued by the Ministry of Town and Country Planning (H.M.S.O., 3d.). It is a summary of the Report on the Restoration Problem in the Ironstone Industry in the Midlands, and is numbered Cmd. 6906. Ironstone is a highly important raw material in the metallurgical industry of this country; and the problem is how to reconcile the winning of this material with the preservation of valuable agricultural land and, to put it bluntly, to prevent the creation of hideous and useless wildernesses. The report in question is a supplement to the Kennet Report of March 1939; like many another difficulty, this one was shelved during the war, and the solution has become no easier. The present report—temperate and well-thought-out—was made by Mr. A. H. S. Waters, V.C., D.S.O., M.C., a distinguished engineer. His main technical conclusions, briefly, are (i) that surface restoration must be considered as part of the ore extraction, and not as something requiring separate treatment; (ii) that developments in machinery, especially since 1945, make effective restoration much more feasible, concurrently with excavation; and (iii) that a legal obligation to effect a certain degree of restoration would lead to yet further beneficial developments in machine design and operation technique. The cost of the work, and the subsequent use of the land, are also fully examined. Some concerns have voluntarily carried out efficient restoration without this obligation; but human nature is such that this practice has been far from universal. We welcome Mr. Waters's findings, not only because they

seem to strike a fair balance between the claims of heavy industry and of agriculture, but also because they will lead to the employment of more skill in designing and more thorough-going efficiency in operation.

Chemical Control of the Potato

NOW that mashed potato powder is on the market in the Birmingham district, under the trade name of "Pom" we understand, renewed attention is being directed to the paper read before the Conjoint Chemical Bodies by Mr. Theodore Rendle at Bristol last November, in which details of the process of drying the potato and still maintaining its palatability were given in full. The material, we believe, is likely to labour under an unfair disadvantage, in that it will inevitably be likened to the dehydrated potato which was supplied in considerable quantities to our troops in Germany, and which did not meet with their favour. Complaints about the sliminess, or "gooey-ness," of the military product do not, however, hold good with the present material, provided that a little elementary care is exercised in its cooking. As Mr. Rendle pointed out originally, the mere addition of four times its weight of hot water (preferably 180°-200° F), with simple stirring, gives a ready-to-eat mash in less than a minute. The point is that the water must not be boiling. In quickness of preparation, this mashed potato powder is rivalled only by canned potatoes; dehydrated potato strips take considerably longer to prepare. Storage presents no commercial difficulties, and we are assured that the taste is quite satisfactory—almost identical, indeed, with the original. The great point in the manufacture is that, throughout, the whole operation calls for careful control and delicate adjustment, as can be seen from a perusal of Mr. Rendle's paper. This application of skilled chemical control to a new "universal" foodstuff is of great interest in these days of monotonous diet.

The Chemist as He Is

THE popular conception of a chemist as a white-gowned gentleman—a very young gentleman in some modern advertisements, but an old one elsewhere—gazing wistfully, pensively or earnestly at a liquid boiling in a test tube, may still linger in the minds of many people. It is fostered by the popular press, which appears to regard the white coat, worn not as a symbol of knowledge but for the sordid purpose of cleanliness, as a mystical shroud which automatically imparts learning and the appellation "expert" on the wearer. A rude jolt has been administered to this conception, partly with the spread of knowledge about the atom bomb, partly by young experimenters who have tried to hold test tubes of boiling liquid in unprotected fingers, and partly by the thousands of ordinary men and women who for the first time came in personal contact with chemists during the war. Another jolt will no doubt be administered when films about chemistry, mentioned elsewhere in this issue, are seen by the public.

Chemistry and Films

THESE films are included in the first list compiled by the Scientific Film Association of 595 films of general scientific appeal, with an appraisal of most of them. Superficially, it would appear that chemistry does not offer much scope for the film-maker, but the list of films on this subject indicates the wide range of choice that he has when the film producer enters the chemical field. Some of the films—especially those dealing with oil—have been made partly for publicity purposes. But this does not detract from their value. And if a few of the films appear elementary to specialists it must be remembered they may prove of great interest and educational value to those not engaged in that particular field. This list of scientific films follows the pioneer "Graded List of Scientific Films" compiled by the Association of Scientific Workers. We are promised future catalogues of specialist films as well as a catalogue of science teaching films.

STREPTOMYCIN

Addressing a press conference held on Tuesday by Boots Pure Drug Co., Ltd., at the London headquarters of the company in Stamford Street, S.E.1, Sir Jack Drummond, D.Sc., F.R.S., who is now director in charge of the company's scientific research, stated that the company hoped to have "reasonable quantities" of streptomycin available within six weeks, but a long time would elapse before large-scale production could be attempted. Production at first would be at the rate of about two kg. a month. He said the chemical structure of streptomycin looked like presenting the organic chemist with one of the most heartbreaking tasks he had known, because of the difficulty of synthesising it. Further details of the conference will appear in a subsequent issue of THE CHEMICAL AGE.

Polythene*

Address in Paris by Dr. Freeth

Dr. F. A. Freeth, F.R.S.

POLYTHENE is a general term for the range of solid polymers of ethylene which are produced by subjecting that gas to high pressures under carefully controlled conditions. The polymer is a saturated straight-chain hydrocarbon in which the length of the molecules is of the order of 1000 carbon atoms.

A fairly full description of the properties of Polythene and some account of the difficulties met with in its production were included in THE CHEMICAL AGE in February last year (1945, *52*, 175). Dr. Freeth, however, provided a more detailed account, from the historical point of view, of the steps leading up to its manufacture, and also a more detailed summary of its properties and especially of its application to Radar.

History

In 1909, the Winnington laboratory of Brunner, Mond & Co., Ltd. (now the Alkali Division of I.C.I.), became interested in the preparation of ammonium nitrate by double decomposition; for example, ammonium sulphate + sodium nitrate giving ammonium nitrate + sodium sulphate. This type of reaction is one depending upon a knowledge of heterogeneous equilibria of the kind which had been worked out by Van't Hoff for the Stassfurt potash deposits, and some of the actual equilibria involved were then being worked out by Professor Schreinemakers of the University of Leiden. During the 1914 war many of the reactions for the preparation of ammonium nitrate were successfully put into operation and large quantities of ammonium nitrate were obtained thereby.

In 1919, contact was made with Professor Schreinemakers and Professor Kamerlingh Onnes of the University of Leiden. This led to a close association between the company's research department and the University of Leiden and, later, the University of Amsterdam, an association which still persists. Several of our young research workers went to Leiden and worked under Kamerlingh Onnes during which time some of them became acquainted with Dr. A. M. J. F. Michels of the University of Amsterdam, who at that time was a lecturer and has subsequently become van der Waals professor.

Dr. Michels was doing a great variety of work at very high pressures and several of our staff worked under his direction. He became one of our consultants and visited us frequently in Winnington. We owe a great debt to his scientific acumen, his experimental skill, and his extraordinary ingenuity. I should like specially to mention that when the isothermals of ethylene were measured by Professor Michels in Amsterdam his results were in extraordinarily close agreement with those of Amagat, obtained half a century ago, which reflect the greatest credit on the experimental genius of this great French pioneer of high pressure.

In 1928, I.C.I. (Alkali) sent out a small commission to visit Amsterdam where one of their staff was already working with Dr. Michels and decided on a programme of work at high pressures. In 1934, Dr. Michels designed at our request a pump capable of giving a pressure of 3000 atmospheres on a modified Cailletet principle which was built by Dikkers at Hengelo. It was with this pump and with apparatus designed by ourselves that we began systematic work on the high pressure chemistry of organic compounds during the course of which we eventually discovered Polythene in March, 1933. The above is the barest outline of the events which led up to the discovery of polythene and, as it were, the curtain is just going up. At that time at Winnington the research department was in charge of Mr. H. E. Cocksedge and polythene research was directed by Mr. J. C. Swallow. The original high pressure team were Messrs. M. W. Perrin, R. O. Gibson, E. W. Fawcett, and W. R. D. Manning.

The reader of the literature now growing on polythene from both sides of the Atlantic may possibly get the impression that important differences exist in the properties of polymerised ethylene from the two countries. Actually comparison shows that there are remarkably few, if any, differences between the products made in this country and America if equivalent grades are taken. The Americans favour a comparatively hard grade of Polythene while the cable industry

* Abridged from the English text of the French lecture delivered in Paris on September 23 by Dr. F. A. Freeth, F.R.S., of I.C.I., Ltd., at the 20th Congress of the Société de Chimie Industrielle.

in Great Britain prefers to use a composition plasticised with polyisobutylene.

The manufacturing position of Polythene to-day is as follows: considerable tonnages are produced from two plants in this country and from two plants in the United States, while plans for new plants and increased output are in active preparation.

Polythene is produced from ethylene obtained either from the oil industry or by the dehydration of alcohol. The Polythene produced in Great Britain is made from the latter. Alcohol vapour is passed over a catalyst at a temperature of 200°C. when it is decomposed into ethylene and water. The ethylene is purified with the utmost care and then carefully and accurately mixed with oxygen in a very small concentration. The mixture is compressed in two main stages at 1200 atmospheres and finally enters the reaction vessel, at 200°C. During the polymerisation a considerable amount of heat is developed and the removal of this has been the subject of ingenious design in the manufacturing plants. The liquid Polythene emerges from the reaction vessel in the form of a pellucid stream which is cast into blocks which are then ready for treatment for manufacture.

Properties of Polythene

Since it is the properties of Polythene that make it so valuable we can now enter into these with some detail. I would like to reiterate that the generic name Polythene covers a whole spectrum of products with gradations in properties, and it is our custom to select from the range the product with properties suited not only to the performance required of the finished article, but also to the processing methods available.

The outstanding electrical properties of Polythene and its low density could be matched in pure paraffin waxes, but in polythene they are combined with remarkable mechanical properties and, as a result, the virtues of the paraffin structure are made available in new fields of application. The new effects, particularly flexibility and toughness, are due to the long molecules which tie the structure together and, since we can control the average molecular weight, we can therefore control the mechanical and physical properties throughout our Polythene range, giving us a wide choice of materials. As frequently happens, it is necessary to compromise. For example, the material is usually processed as a thermoplastic. Now, while high molecular weight improves the properties desired in the finished article, it also causes great increases in resistance to flow when melted, and a limit is usually set by the capabilities of the processing machinery available.

The following are some of the principal physical properties. At 20°C. the power factor (tan d) varies between 0.0001 and 0.0003 and is practically independent of frequency from 10^3 cycles per second up to highest frequencies used technically, and the permittivity from 50 to 2×10^9 cycles per second is 2.3 at 20°C., which falls to 2.1 at 70°C. In fact, the electrical properties are what could be expected from its hydrocarbon structure. It has an active point between 110°-120°C. at which point all crystallising disappears. Its mechanical properties are typical of crystalline polymers in that it shows the property "cold drawing" in thin sections in the same way as gutta percha. The stress at which this phenomenone occurs is about 1500 lb./sq. in.

The compromise between high molecular weight and means of processing has so controlled the development of Polythene in Great Britain that varieties are classified on a scale based on fluidity in the molten state at 190°C. To enter into the details of this would require not one but a series of lectures, and I can only refer my hearers to papers such as appear in *British Plastics* in March, April and May of last year's issues under the names of Hunter, Oakes, Richards and Midwinter, and for scientific publications on the properties of the product as they are related to its structure to the publications in the Faraday Society, of which I have reprints here.

Resistance to Chemical Attack

Massive Polythene, such as sheets, films, coatings on metal, mouldings, and extruded sections, as would be expected, is chemically highly resistant and can be used extensively where such a property is of importance. It is however important to remember that it is a hydrocarbon and therefore liable to oxidation, although to a far smaller extent than rubber. Such oxidation can be inhibited by use of suitable antioxidants.

Halogens attack Polythene, but except at high temperatures the mechanical properties are not appreciably affected. It is remarkably resistant to acids and alkalis; 40 per cent. caustic soda is without action. It is extraordinarily resistant to hydrofluoric acid and suffers no mechanical deterioration. In air in the presence of ultra-violet light or strong sunlight there is a very slow discoloration and slow oxidation if no antioxidant is present.

Water Absorption and Diffusion

Polythene, being a hydrocarbon, absorbs water to a very slight extent, normally less than 0.05 per cent. Its resistance to permeability by water vapour is very good and it is one of the best of plastic waterproof film-forming materials, is comparable with rubber hydrochloride and moisture-proofed regenerated cellulose film, and is superior to polystyrene, rubber and cellulose esters. Paper or cardboard can be coated or im-

pregnated with Polythene and Polythene may be added to wax for use in waterproofing paper in order to raise the softening point and to improve the crease-resistance of the proofed paper.

When especially large or complicated articles have to be made, sheets and tubes of all grades may be joined by hot gas welding. A stream of nitrogen at 200° C. is directed on to the joint and a Polythene filler rod used to make the weld. In this way large containers for corrosive acids, pipes 3 or 4 ft. in diameter, T-pieces, flanged pipes, etc., may be fabricated. Polythene sheet may also be manipulated at a temperature of about 105° C. by bending and shaping over formers or by blowing with air at a pressure below 5 lb./sq. in. Polythene may be machined very easily, using ordinary wood-cutting tools and moderately high speeds.

Polythene in the War

The electrical properties of Polythene attracted the attention of the Services and of other Government Departments at an early date. In the I.C.I. the development of the applications of Radar was in the hands of Messrs. P. Allen and E. G. Willams. The pioneer of Radar in Great Britain, Sir Robert Watson-Watt, F.R.S., has been kind enough to give me the following statement on the matter. I now quote his words:

The introduction of Radar for fixed ground stations in 1935 led to an immediate and insistent demand for the design of mobile stations for land use, of shipborne sets, and for the fitting of complete Radar installations in combat aircraft. Difficult as were the ground and shipboard problems, they were easy compared with those of the airborne installations. High voltages are unpopular in the air, and an aircraft which must be parked in the open in all weathers, ready for instant action, is one of the least attractive platforms for equipment which on the one hand requires many kilovolts for its operation and on the other depends on a precise comparison of two very short-wave radio signals so weak as to be on the limit of perception at the moment when vital combat tactics have to be based on the comparison. Losses of energy had to be reduced to a minimum even when they were constant in value; variation due to moisture affecting differently the two sets of receiving aerials and the loads from them was fatal to directional accuracy. The airborne set could work effectively only on wavelengths under two metres and best of all on wavelengths under 10 cm. Orthodox dielectrics had intolerable losses or unacceptable mechanical limitations.

The availability of Polythene transformed the design, production, installation, and maintenance problems of airborne Radar from the almost insoluble to the comfortably manageable. Polythene combined four most desirable properties in a manner then unique. It had a high dielectric strength, it had a very low loss factor even at centimetric wavelengths, it could fairly be described as moisture-repellent and it could be moulded in such a way that it supported aerial rods directly on water-tight vibration-proof joints backed by a surface on which moisture film did not remain conductive; and it permitted the construction of flexible very-high-frequency cable. A whole range of aerial and feeder designs otherwise unattainable was made possible, a whole crop of intolerable air maintenance problems was removed.

So Polythene played an indispensable part in the long series of victories in the air, on the sea, and on the land, which were made possible by Radar. Polythene was an essential element in that "single technical device" to which the Fuhrer ascribed the "temporary" (but it proved, enduring) "set-back" experienced by his U-boats.

It made its contribution to the major naval combats typified by the action in which, as the Commander-in-Chief said, "find, fix, fight, and finish the *Scharnhorst*." It had its part in such continuing operations of the smaller naval craft as were delightfully summarised in one report "Our M.T.B.'s were enabled to detect the convoy, retire for a conference while they plotted enemy course and speed, deliver a deliberate and successful attack unobserved, and retire with the enemy still in doubt as to what had hit him." It had its vital place in the small batch of sets of anti-U-boat airborne Radar equipment which, with their shipborne counterparts—also Polythene-aided—permitted the sinking of a hundred U-boats within a very few weeks.

And centimetric aerial systems in Polythene moulding multiplied the effectiveness of our bomber force by a very large factor indeed; the ruins of Hamburg and Berlin are a monument to a co-operation in which Polythene played a great part.

The A/B Cellul, of Karlstad, Sweden, has started on the construction of a rayon plant costing about 28,000,000 kronor. Production will be based on the method developed by the Industrial Rayon Corporation, the patents for which were acquired last autumn by Courtaulds, Ltd. The latter firm has recently transferred the patents for Sweden, Norway, Denmark and Finland to the Swedish Cellul company. The new plant will be built at Alvenäs in Värmland, and the output will include, in addition to rayon, material needed in the manufacture of motor tyres.

Monsanto Expansion

Large New Works Planned

A WELL-SITUATED site of 125 acres in the Newport development area has been acquired by Monsanto Chemicals, Ltd., for the construction of a large chemical works. Every endeavour is to be made to have the works in production early in 1938. Full-time employment will be available for between 500 and 600 local men.

Dr. L. F. Nickell, chairman of the company, stated in an interview that this Newport project is only part of Monsanto's £2,500,000 plans to expand their manufacturing and research activities, which have been well-established at Ruabon and Sunderland for nearly twenty years. The company has already allocated a large proportion for plant extension and the building of spacious research and development laboratories at their Ruabon works. A certain amount of this plant extension is now in hand. A start on the construction of the laboratories is scheduled for early in 1948 and, when completed, it is believed that they will be among the best equipped of their kind in the country.

Among the many benefits that Monsanto's proposal to go into production in Newport would bring to the area, one of the most important is that about 95 per cent. of the employees required will be men. Great importance is attached to this by the Newport Development Committee as the normal labour demand made by industries opening up in the development areas is for women operators. Another aspect of this Monsanto project that is causing great satisfaction is the increased use that will be made of Newport's excellent port facilities. It is expected that more than half of Monsanto's production at Newport will be available, directly or indirectly, for export.

A.B.C.M.

Branch Office in India

THE CHEMICAL AGE is informed by the Association of British Chemical Manufacturers that its plans for the establishment of a branch office in Bombay will now be advanced by an immediate personal visit by Mr. R. Murdin Drake, one of the managers of the Association.

Mr. Drake will be accompanied by Mr. A. St. J. Shuttleworth, who will act as manager of the branch office. Mr. Drake and Mr. Shuttleworth will as far as possible be arranging to meet in India all those who are interested in any way in the services which the branch office hopes to be able to offer. Their address for correspondence in the immediate future will be c/o Hongkong & Shanghai Banking Corporation, P.O. Box 602, Bombay.

Radio-Active Materials

New Research Station

A NATIONAL centre for the processing and distribution of radium, radon and artificial radio-active substances required for scientific, medical and industrial purposes, is to be established at Amersham, Bucks., as a Government establishment, operated by Thorium, Ltd. The extraction of radon, which, during the war was carried on at Barton-in-the-Clay under the Medical Research Council, will also be transferred to the new centre. Johnson Matthey & Co., Ltd., are voluntarily handing over to the new centre the whole of the business of filling radium into containers which they have conducted for many years.

Certain immediate additions will have to be made to the Amersham premises. It is expected that the work will expand considerably. It is intended to remove the centre to new premises when the shortage of building labour has eased, and it becomes possible to form a clearer view of the volume and scale of the work. The work, which will be closely integrated with the Ministry of Supply's activities in the field of atomic energy, will be controlled by a council which will include representatives of the Ministry, of the managements and of users.

Scientific Films

New Catalogue

THE "Catalogue of Films of General Scientific Interest available in Great Britain" compiled by the Scientific Film Association, has just been issued by Aslib (Association of Special Libraries and Information Bureaux). It contains the titles of the following films which may be of interest to chemists:

A.B.C. of Oil; Asphalt Lake; Chemical Work in the Centrifuge Cone; Chemical Work on the Microscope Slide; Coal—Scientific Methods of Coal Mining in the U.S.S.R.; Colloids in Medicine; Concerning the Crystal; Crystals; Damage Control—The Chemistry of Fire; Danger Area—Work on Explosives; The Discovery of a New Pigment; Distillation; Drilling for Oil.

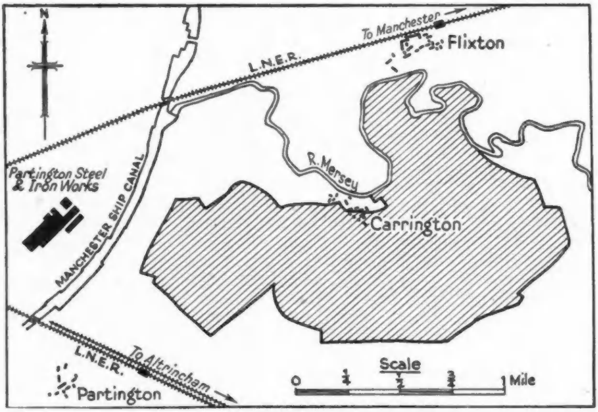
Factory Fire Guard; The Film of Paint; First Principles of Lubrication; Furnaces of Industry; Handle with Care—The Chemistry and Manufacture of Explosives; How Steel is Made; How to Machine Aluminium; Industral Injuries; It Comes from Coal; Looking Through Glass; Making China; The Manufacture of Gas; The Mica Industry; Modern Steelcraft.

Oil from the Earth; Paraffin Young—The Work of James Young the Shale Oil Pioneer; The Production and Distribution of Medical Gases; The Production of Nickel; The Refining of Platinum and other Precious Metals; A Romance of Engineering.

Aromatics from Petroleum

New Works to be Erected

IN 1945 a company called Petrocarbon, Ltd., was formed to acquire from Dr. Ch. Weizmann the exclusive right to operate, under his patents, the Catarole process* in the United Kingdom and a great number of European and overseas countries. Catarole is the name given to a new process which makes possible the simultaneous production, from an essentially non-aromatic charging stock (such as naphtha or gas oil), of the whole range of the aromatic hydrocarbons in substantially pure form, and of a gas mixture containing a high proportion of olefines. A pilot plant for the development of the Catarole process has been working since 1941, to study the influence of operating conditions and of different charging stocks.



The shaded area indicates the site on Merseyside taken over by Petrocarbon, Ltd., for the erection of plant for the production of chemicals from petroleum. Sites will be available for factories using the raw materials provided.

Now it is announced that Petrocarbon, Ltd., have made financial arrangements for the construction of a large commercial plant to operate the process on a full industrial scale. Construction and operation will be undertaken by a wholly-owned subsidiary company, Petrochemicals, Ltd., under the control of Petrocarbon, Ltd. Initially, the new plant will have a capacity of 50,000 tons per annum of charging stock, but provision has been made for expansion to deal with an input of up to 100,000 tons yearly. The most modern features of heat economy are to be incorporated, including use of back pressure turbines for the generation of power.

For the erection of the new plant, a site of over 700 acres has been purchased at Partington near Manchester. Sanction has been granted by the planning authorities for the industrial development of a large proportion of this area. The land runs alongside the Manchester ship canal and thus has direct access to ocean-going vessels *via* Liverpool. Further, such a situation places the plant in the centre of one of the most highly industrialised areas of England, with a large network of communications for efficient internal distribution. The site acquired is substantially larger than that needed solely for the Catarole plant. The intention is to provide space for the construction of plant by users of the basic raw materials which Petrochemicals will be producing. It is believed that Catarole will provide a nucleus around which other factories will be built, because it will provide many basic raw materials for the organic chemical industry.

The liquid reaction product from the Catarole process contains almost the complete range of high- and low-boiling aromatic hydrocarbons such as benzene, toluene, xylenes, ethylbenzene, styrene, alkyl-benzenes, naphthalene, alkyl-naphthalenes, anthracene, phenanthrene, fluorene, pyrene, and chrysene, all of which may be obtained in pure grades by azeotropic or fractional distillation and crystallisation, with only slight additional chemical treatment. Syntheses using aromatic hydrocarbons and olefines as starting materials (such as, for instance, the production of styrene from ethylene and benzene, or of isopropylbenzene from propylene and benzene) which have become an important feature of modern

* Weizmann and co-workers, B. PP., 552,216; 574,963; 574,973; 575,383; 575,766; 575,768; 575,769; 575,771.

chemical industry, can be carried through economically and with great ease because both components are available on the same site. Another favourable feature of the process is its flexibility: within certain limits it is possible to vary the proportions of the different chemicals produced, so as to suit changing market requirements.

All the products from the process are used in the manufacture of a wide range of commodities such as: paints and varnishes, dyestuffs, pharmaceuticals, photographic chemicals, synthetic fibres, synthetic rubbers, solvents, plastics, plasticisers, cosmetics, and insecticides. Also some of the products have uses either as solvents, heat media, or blending stock for engine fuel. The need for expanding home production of these materials has been recognised by the Hydrocarbon Oil Duties Committee and has been repeatedly stressed by a number of leading consumers. The raw materials of the Catarole process are primarily naphtha and gas oil, which are both in abundant world supply, and can be either imported or produced in refineries in this country. So flexible is the process, however, that other starting materials may also be used, such as shale oil or the coal oil from the low-temperature carbonisation of coal. The chemicals, solvents, spare parts, etc., required for the operation of the process are all available inside this country.

The provision for capital required for this project, including working capital, is about £1,800,000, and it is expected that the plant will be ready for operation in 1948. Mr. H. E. Charlton will be chief engineer in charge of construction. Thus, the research work started in the laboratories some 10 or 12 years ago by Dr. Weizmann and his co-workers—chief among whom was Dr. Ernst Bergmann—has been brought to a commercial stage by Dr. Franz Kind and in associated technical staff. Dr. Weizmann has agreed to act as head consultant to the undertaking and Dr. Bergmann will be technical consultant. It is intended that the research and development programme of both Petrocarbon, Ltd., and Petrochemicals, Ltd., will be on a considerable scale, and Dr. H. Steiner will be in control of these activities.

Directors of the New Companies

The board of Petrocarbon, Ltd., consists of: Mr. R. Ashton Hamlyn, O.B.E., F.C.A. (chairman), Mr. R. E. F. de Trafford, O.B.E., Mr. T. L. McC. Lonsdale, Dr. F. Kind, Ph.D. (Vind.) (managing director), Mr. G. Tugendhat, LL.D. (Vind.), M.Sc. (Econ.) (managing director), Lt.-Gen. Sir W. G. Lindsell, G.B.E., K.C.B., D.S.O., M.C., and Mr. M. A. Colefax. The board of Petrochemicals consists of: Mr. H. Stuart Ebben, O.B.E. (chairman), Lt.-Col. R. L. Benson, D.S.O., M.V.O., M.C., Dr Kind (managing director), Dr. Tugendhat (managing director), Lt.-Col. Sir W. G. Lindsell, and Mr. M. A. Colefax. Dr. Kind and Dr. Tugendhat for the last ten years have been largely engaged on the building up of the Manchester Oil Refinery group of companies, with which the Catarole project is closely connected. The London offices of the companies are at Adelaide House, London Bridge, London, E.C.4. The registered offices are at River Plate House, 12/13 South Place, E.C.2. The research laoratories are at Twining Road, Trafford Park, Manchester, 17, and the construction and development offices are at Clarendon House, 24 Clarendon Road, Eccles, Manchester.

Some account of the salient points of the Catarole process will be included in our next week's issue.

Individualist Luncheon

Captain Gammans Attacks the Government

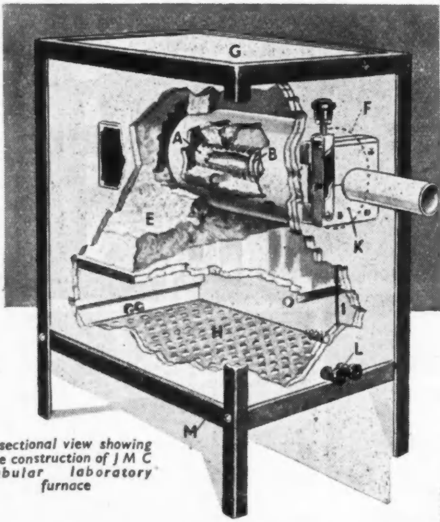
AT a luncheon held by the Society of Individualists and National League for Freedom at the Connaught Rooms, London, on Thursday last week, Captain L. D. Gammans, M.P., made a slashing attack on the present Government.

Introduced by Sir Ernest J. P. Benn, Bart, C.B.E., president of the Society, who compared the present House of Commons, or two-thirds of it, to the pre-war Reichstag—"a solid, crowded phalanx, dumb, silent and determined"—Captain Gammans began with the assumption that his hearers agreed they had a thoroughly rotten and incompetent Government which had already done irremediable damage, and that the sooner it was got rid of, the better. In his opinion, there were "probably not half a dozen men on the Front Bench whom any business man would pay £500 a year." He doubted whether even the people in intimate contact with business realised how the commercial position of this country had deteriorated. During the war, we lost our overseas trade and much of it would never be recovered. We also lost the greater part of our overseas investments and to-day we owed £4,000,000,000 in the sterling area and that had gone up by £350,000,000 in the last six months. Last month we imported £120,000,000 worth of goods, but we exported goods worth only £77,000,000. After pointing out that nationalisation had failed, in the short run, to provide more coal, and that the loss of liberty was the biggest indictment against the Government to-day, Captain Gammans devoted the remainder of his speech to contending that if the Conservatives had been returned to power they would have done better than the Socialists, if for no other reason than that they could scarcely have done worse.

Metallurgical Section

Published the first Saturday in the month

TEMPERATURES UP TO 1,500° C



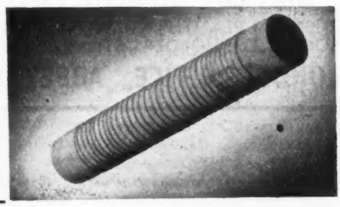
A sectional view showing the construction of J M C tubular laboratory furnace

- A High temperature refractory
- B Rhodium-platinum alloy element
- C High temperature insulation
- D Medium temperature refractory tube
- E Medium temperature insulation
- F Asbestos sealing washer
- G Sindanyo heat-resisting case with removable end plates
- H Perforated iron plate
- J Reinforced connecting leads
- K Combustion tube clamp
- L Thermocouple terminals
- M Vitreous enamelled frame

maintained for long periods in the

TUBULAR LABORATORY FURNACE

with Rhodium-Platinum Alloy Element



The range of J M C platinum wound electric furnaces is designed for general combustion work at temperatures up to 1,500° C. Thermal efficiency is high, heat losses being reduced by carefully graded lagging and a special refractory cylinder, consequently high temperatures can be maintained with exceptionally low power consumption. Type T5 operating, for example at 1,350° C. with a load of 700 watts, consumes 0.5 units per hour.

Standard models are available complete with control unit, thermocouple and pyrometer, or special designs can be built to meet individual requirements.

Full information is contained in J M C publication 1740.

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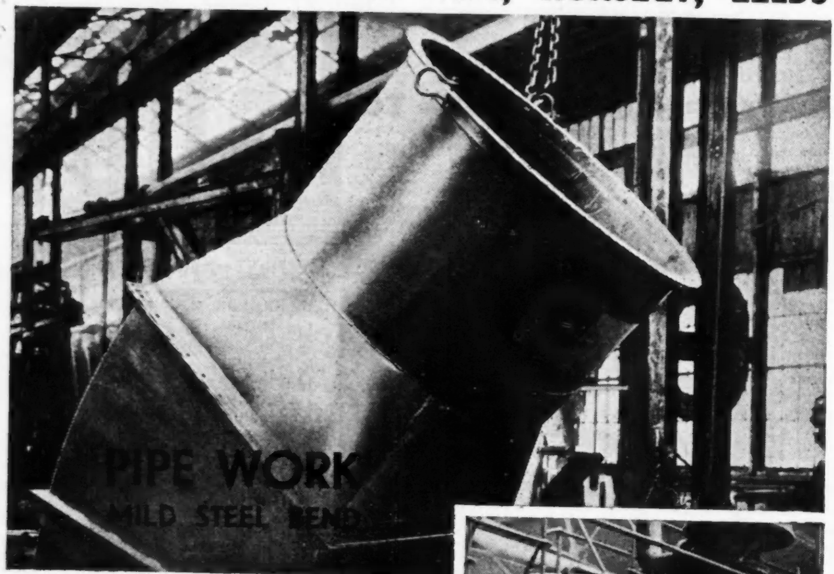
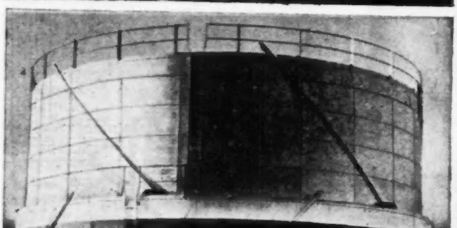
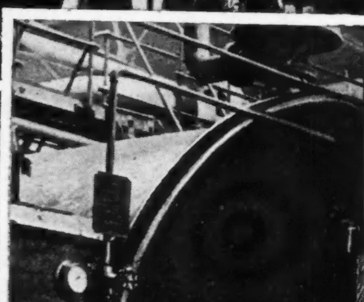




SPIRAL GUIDED GASHOLDER—AUSTRALASIA



LANCASHIRE BOILER

Metallurgical Section

October 5, 1946

Ferrous Metallurgy in Russia

Recent Work on Cast Iron and Alloy Steels

by W. G. CASS

IN Russia as in other countries a distinction has long been drawn between the older or purely extractive metallurgy and the newer physical metallurgy. The term *Metalloredeni(y)e* is now often used to denote this latter, and is analogous to the German *Metallkunde*. During the past decade quite a number of books on physical metallurgy and metallography have been published in Russia, though it is still somewhat difficult to obtain copies. Among the most recent on physical metallurgy are those of A. A. Bochvar (1945), G. A. Kashchenko (1940), and N. F. Bolkhovitinov (1946). The last-named has become one of Russia's leading writers in this field, and has several earlier works to his credit, such as "Metallography and Heat Treatment" (1933), "The Research Department of a Tractor Factory" (1935), and "Grain Size and Properties of Steel" (1943). The following notes are based mainly on his latest book (1946) with some assistance also from a few scattered journal articles.

The exact title of Bolkhovitinov's latest is "Physical Metallurgy and Heat Treatment of Steels," though it also has a considerable section on cast irons, and the book, within the comparatively short compass of some 300 octavo pages, contains a wealth of information, tables, diagrams, and Russian official metal specifications; but it must be admitted that interest in American is far greater than in British metal research, for comparisons with American practice and specifications are frequent throughout the book.

The first three chapters deal with basic principles and the theory of alloys, with particular reference to iron-carbon alloys; and carbon steels form the subject of Chap. IV, including structure and properties, and special applications for cutting tools and stampings. Methods of manufacture, microstructure, and effect of alloying elements are dealt with in detail. The Russian specification for constructional steels, used for the most part without special heat treatment, is GOST 380/41, and for special heat-treated steels GOST V.1050/41. Manganese is an important element in the latter, and reference is made to the fact that, owing to the more plentiful supplies of manganese in Russia, that metal is more extensively used in steel manufacture than in the U.S.A. Later in his book the author points out that the converse holds in regard to molybdenum which is relatively plentiful in the U.S.A. and scarce in Russia. On the subject of comparisons between America and Russia, the view is also expressed that specifications in the former country are too numerous, having only slight differences between them (*e.g.*, in carbon content).

The manganese content of the special steels included under V.1050 is: 0.70-1.00 per cent. Mn in the 15G, 20G, 30G, 40G, 59G and 60G types; 0.90-1.2 per cent. in the 65G and 70G; from 1.20-1.60 per cent. Mn in the 10G2; and from 1.40-1.80 per cent. Mn in the 30G2, 35G2, 40G2, 45G2, and 50G2. Content of nickel or chromium does not exceed 0.30 per cent., that of phosphorus 0.045 per cent., and of sulphur 0.055 per cent. These are compared with the corresponding American (AISI-SAE) two series: (1) Martin & Bessemer steels, and (2) automobile steels, containing respectively 84 and 31 marks or grades, or 115 in all.

In the section of Chap. IV which treats of cutting tools and instruments reference is made to the Russian specification GOST V.1414/42 governing this class of steel, and comprising the A series (A12, etc.). A12 contains 0.08-0.16 per cent. C, 0.08-0.20 per cent. S, and 0.08-0.15 per cent. P, while A20 contains 0.15-0.25 per cent. C, 0.08-0.15 per cent. S, and not more than 0.06 per cent. P. These are the so-called automatic steels with relatively high sulphur and phosphorus content, used largely in Russia for agricultural machinery. They must be easily worked, and to this end the inclusion of some lead up to about 0.2 per cent. may be beneficial. This element does not enter into solid solution with iron. Aluminium and silicon should be avoided as alloying elements, since they form hard abrasive compounds which may play havoc with cutting tools.

Grey cast irons described in Chap. V are mainly governed by Russian specification GOST V. 1212/42, containing from 1.7 per cent. carbon. Their mechanical properties depend largely on graphitic formation, and

in discussing their micro-structure the author draws attention to the scale used by the ASTM and its formula. The above-mentioned specification comprises the "Sch" series, having a Brinell hardness of 143 to 241, and may be read in conjunction with the official standard (OST 26049) for graphic classification. Cast iron with extensive diffusion of large graphite grains shows a coarse-grained fracture, has comparatively low resistance to fracture, and reduced hardness.

According to OST 26049 graphite grains are classified as follows: Gl, large; G2 medium; G3 small; G4 very small; G5 pin-points. The large are above 300μ, the medium 150-300μ, the small 80-150μ. Other grades are G6 and G7, according to shape; and G8, G9, and G10 according to distribution. The following table gives mechanical properties of some Russian cast irons according to structural phase:

have many valuable properties and are widely used, *e.g.*, in the Ford crankshafts, and are more reliable than steel, as well as less liable to wear owing to easier lubrication.

On the subject of alloy cast irons, including white irons, the author considers the natural cast irons in Russia are of particular value, such as those of Orsko-Khalilovsk and Elizavetinsk. Those of the first-named place contain 3.25 per cent. chromium, 1 per cent. nickel, and 0.2-0.5 per cent. titanium, while the latter contain 1.1 per cent. chromium, 0.9 nickel, and 0.1-0.25 per cent. vanadium. They can, it is said, be usefully employed as additions in the manufacture of some cast irons to which they impart special properties. Additions of chromium and nickel, in fact, have been much studied in Russia in their effect on cast irons. The former tends to bring about a pearlitic structure, while nickel has a graphitising

TABLE 1

Structure element	Sp. gr.	Hardness (Brinell)	Tensile strength kg/mm²	Elongation %
Pure ferrite ...	7.86	60	30	40
Ferrite with 0.80% Si	—	90	40	30
„ „ 2.3% Si	—	124	45	25
„ „ 3.4% Si	—	150	55	20
Cementite ...	7.66	700–850	—	—
Lamellar pearlite ...	7.85	200–250	60–100	10–12
Ledeburite ...	—	650–800	—	—
Phosphorus eutectic	7.32	650–800	—	—
Manganese sulphide	4.0	—	—	—
Graphite ...	2.55	—	—	—

The official standard OST also includes a classification of the phosphorus eutectic according to the extent and nature of its diffusion. In discussing effect of various addition elements phosphorus indeed occupies an important place. In irons containing up to 0.5 per cent. P most of this enters into solid solution with ferrite; but where there is fairly high local concentration of phosphorus the small points of the phosphorus eutectic are very noticeable. The melt or flow point of this eutectic is 950-980° C.

The importance of graphitisation and control methods are considered at some length, including a reference to the use in the U.S.A. of the Michanite method patented by A. Michan. A silico-calcium flux, containing also some aluminium and iron, is used, so that calcium carbide is diffused throughout the cast-iron mass. The author adds that such an iron, when fractured, emits a smell of acetylene, which is hardly surprising if any moisture is present, occluded or otherwise. Control of graphitic centres may also be achieved, according to English workers, Norbury and Morgan, by use of a flux containing 0.2 per cent. titanium with blown in carbon dioxide. By subsequently blowing in hydrogen the titanium dioxide formed is reduced and very large graphitic centres are obtained. Graphitic cast irons of special structure

action and tends to produce a sorbitic form by modifying or reducing the pearlite. Reference is made to the three types of alloy cast iron used by Ford—chromo-nickel, copper, and chrome-copper—and a list of these is tabulated, the carbon content varying from 0.15 to 3.9.

Malleable cast irons are dealt with at some length. They are largely used in Russia where they are made from white irons following American practice. The manufacture of pearlitic malleable by the so-called European methods is now seldom seen in Russia even in the oldest factories. Following are extracts from relevant GOST specifications:

TABLE 2

Group	Mark	Tensile strength kg/mm², at least	Spec. elong %	Brinell hardness not exceeding
Ferritic (U.S.A.)	KCh 37–12	37	12	149
	35–10	35	10	149
	32–8	33	8	149
	30–6	30	6	149
Pearlitic (European)	40–3	40	3	163
	35–4	35	4	201
	30–3	30	3	201

It will be noted that the figures used in the mark correspond respectively to tensile strength and elongation percentage. In other cases the marks are designated by a group of initial letters and figures indica-

ting to some extent the elemental content of the material.

The interesting structure of white cast iron has been closely studied in Russia, and owing to the extra hard surface formed in this type of iron through rapid cooling it is being increasingly used in that country under a wide range of applications. K. P. Bunin and others have investigated the effect of graphite in white cast iron (*Trudy, Ural*, etc., 1944, *19*, 80-6). They state that the graphite content increases in proportion to the size of the ferritic grains formed by rapid cooling in ice-water; and also varied according to the temperature range, 1200 to 1500°C., at which the melt was kept for some minutes before cooling. Graphite content was lower, 0.06 per cent. at the higher temperatures. According to Doan and Mahla (*Principles of Physical Metallurgy*, 2nd ed.) rapid cooling in these white irons leads to the formation of Fe_3C crystals only, and there is little or no graphite.

Further, on the subject of graphitisation to which reference has already been made, it may be of interest to recall the paper on the chemical composition of malleable irons —often made from white iron by increasing graphitic structure—read by H. A. Schwartz before the American Foundrymen's Association early this year, in which he discussed among other things the conditions that alter response to graphite formation. The author found that the elements hindering this formation are chiefly Cr. Mn, and Mo, while those which favour graphitisation include B, P, Si, Ni, Co, Cu, etc.

In Russia, S. A. Saltikov has reported on the effect of rapid annealing of thin-walled castings in water or oil on graphitising. He found that the number of graphitic centres per sq. mm. after normal annealing was 20-25 but after a special accelerated treatment it was 120-2200, as revealed under a magnification of 130.

Steel Marks

It may be of interest at this stage to refer to the Russian method of indicating steel marks or brands in their specifications. To a limited extent the marks are descriptive and indicate the content of various elements in the steel. Thus Kh = chromium, G = manganese, N = nickel, Ph or F = vanadium, M = molybdenum, V = tungsten, Yu = aluminium, S = silicon, D = copper, K = cobalt, and T = titanium. These letters by themselves indicate at least 1 per cent. of the element, and are preceded by two figures to represent the carbon content (in hundredths per cent.), *i.e.*, 12 = 0.12 per cent. Therefore the mark 12KhN3A means 0.12 per cent. C, about 1 per cent. Cr and 3 per cent. Ni (A representing a sub-class or group). This method of marking is compared with the American AISI-SAE which have closer limits of carbon content and are probably more convenient in this respect.

But this nomenclature is only very approximately descriptive, and is not always strictly followed. For example, we have the mark 15KhPh = 0.15 per cent. carbon, about 1 per cent. chromium, and 0.2 per cent. vanadium, in which the last-named, though present in such low concentration, is yet included in the mark; whereas in 50KhN (containing percentages of 0.45-0.55 carbon, 0.50-0.80 manganese, 0.45-0.75 chromium, and 1.00-1.50 nickel) though containing therefore less chromium than manganese yet includes the chromium but not the manganese in the mark. These manganese constructional steels are divided into two groups (1) modified steels, and (2) high-modified steels, the latter having an A at the end of the mark.

They all contain 0.15-0.30 per cent. silicon except in 30KhGS which contains 0.90-1.20 per cent. Si, while the sulphur and phosphorus limits are 0.05 and 0.04 per cent. respectively. Carbon percentage ranges from 0.10 to 0.55; manganese from 0.25 to 1.20; chromium from 0.60 to 1.75, and nickel from 0.10 to 4.60 (the higher Ni content is mainly found in the second or A group). This second group includes members with varying additions of molybdenum, tungsten, or aluminium (0.15 to 1.25 per cent.).

Heat Treatment

As in other countries, much research in Russia is now concentrated on heat treatment of various steels, and this indeed forms the sub-title of Bolkhovitinov's book. By way of example, it may also be added that I. E. Brainin (*Stal.*, 1945, 67-77) has recently investigated the thermal treatment of 38KhMYuA, which appears to be the same as the 35KhMYuA included in the tables above-mentioned (in which the carbon content ranges from 0.30 to 0.38 per cent.). In regard to the effect of preliminary heating on crystal growth, mechanical properties, and the appearance of a stone-like fracture in this steel, it was found—as might indeed be expected—that crystal growth is a direct function of temperature of preheating. Intensive growth of grains started at 1000°C. There was no relation between preliminary heating and impact strength; but the smaller the molybdenum grain size the greater the impact strength. The value of impact strength and its determination, as a measure of the quality of steels, has lately been discussed by N. N. Davidenkov in *J. Tech. Phys. U.S.S.R.*, 1945, *15*, 310-317; and the effect of aluminium in iron by A. T. Grigor'ev of the Inst. Gen. Inorg. Chem. at Moscow.

The low-alloy steels of which the composition has lately been published include the so-called DS (Dvortsa Sovet or Soviet

Palace) steel, and the Kortem, Manten, Miari P, and Naks steels, containing from 0.10-0.30 carbon, 0.5-1.6 manganese, 0.3-0.7 copper, about the same for chromium, while some contain a little nickel; phosphorus is limited to 0.12 in Miari P, and much less in the others.

Special-purpose steels are being developed in Russia for agricultural machinery, notably tractor engines and parts, for cutting tools, and also for stampings. Among instrument (and cutting-tool) steels are included both the plain carbon type and alloy steels, in which the chromium group predominates—chromium, chromo-silicon, and chromo-manganese. In some cases, as in the Kh12 and Kh12M specifications, the chromium content, as indicated in the mark, is 11-13 per cent., and these steels are subjected to special heat treatment, including annealing in oil or air at 975-1030° C.

Stamping Steels

Steels for shaping and stamping are also growing in importance in the Soviet Union, and these, too, are mainly of the chromium type. Some of the marks are: 6KhNM, 5KhGM, 4KhS, 6KhS, 4KhVS, 7Kh3. As will be seen the carbon content ranges from 0.04 to 0.07 per cent. while the chromium may be up to nearly 4 per cent.; for in the last one, though chromium is given as 3, the actual content of this element is 3.2 to 3.8. No. 5 in the above list (4KhVS) also contains 2.0-2.5 per cent. tungsten, and although M is included in the first two marks the actual percentage of this element (molybdenum) is only 0.15 to 0.30. In addition to these are several other special steels (27 marks in all) used for stampings and forgings, including 5KhNM, 3KhV8, 5KhVS, KhG, Kh12, and Kh12M. The high tungsten content of the second will be noted. The three marked 6KhNM, 5KhNM, and 5KhGM are largely used for hot stampings. They have deep tempering or annealing properties and permit isothermic or uniform annealing, to an appreciable depth, of stampings of large section, as shown by the various S curves which have been prepared.

In the high-speed cutting steels group the system of marking with significant letters and figures is not apparently used. These steels are designated as RPh1, R18, 18-4-1, etc., containing 0.70-0.80 per cent. C, 17.5-19.0 per cent. W, 1.1-1.4 per cent. V, 3.75-4.5 per cent. Cr, 0.5 per cent. Mo. The cast steels have a carbide structure in the eutectic which, with mechanical and thermal working, changes into grains or crystals of varying length. The structure of forged or similarly treated high-speed cutting steels consists, to the extent of about 30 per cent. of complex carbides of the type $(Fe, W, Cr, V)_6C$, and about 70 per cent. of ferritic alloy. Some of these steels are also classed as low-alloy steels, with the EI class mark, with the following composition (two American are included for comparison):

TABLE 3

Mark	C	W	Mo	Cr	V
EI 184	0.80–0.95	4.5	.—	7–9	1.0–1.4
262	0.85–0.95	8.5–10	—	4–4.6	2–2.6
290	0.90	3	3	4	2
U.S.A.	0.75–0.90	5–6	3.5–5.5	3.5–5	1.25–1.79
„	0.80–0.90	5–6	1.2–1.5	4.2–4.8	1.4–1.6

Research on hard alloys and metallic carbides (metallo-ceramics) is extensively pursued in Russia as elsewhere, in view of the great and growing importance of these products, and despite the increasing attention now given to synthetic gems of the alumina (corundum) form. In Russia they are known as the Pobedit or Victory type, RE series, with the usual cobalt matrix or binder, alone or with a little molybdenum. In the RE-3, -6, -8, -12 and -15 series, the cobalt content is given by the mark figures (3 per cent., 6 per cent., etc.), the balance being tungsten carbide; but Pobedit alpha 21 contains 8 Co, 68 WC, 21 TiC, and 1 Mo, and P-alpha 15 contains 5, 78, 15, and 1 respectively. Sergonit S2 is practically the same as P-alpha 21 except that it contains 69 tungsten carbide and 20 titanium carbide. Since cobalt is somewhat scarce in Russia it is sometimes replaced by nickel, and these hard alloys are then called REnicks. The cast hard alloys usually contain from 13.5 to 35 per cent. chromium, with varying smaller amounts of Ni, Mn, and Si, or fairly considerable amounts of Co and W, and bear the names Sormite No. 1, Sormite No. 2, Stalinit, and Stellit.

TABLE 4

	Sormite No. 1	Sormite No. 2	Stalinit	Stellit
C	2.5–3.3	1.5–2.1	10	0.5–2
Cr	25–31	13.5–17.5	18	29–35
Ni	3–5	1.5–2.5	—	—
Mn	0.5–1.5	0–1.0	15	—
Si	2.8–4.2	1.5–2	—	—
Co	—	—	—	35–55
W	—	—	—	9–15
Fe	55–67	74.8–81	57	4–13

A trade agreement has been signed between France and Turkey for the exchange of goods to the total value of 1,500 million francs within the next twelve months. France will supply chemicals, chemical products, optical and precision instruments, serums and vaccines, pharmaceutical specialities, etc., in exchange for chrome ore, antimony, pitchblende, tanning extracts, copper, etc.

The well-known French journal, *Bulletin des Matières Grasses*, issued by the Colonial Institute at Marseilles, is now to be published under the aegis of the Institut de Recherches pour les Huiles de Palme et Oléagineux, and will be entitled *Oléagineux*. The subscription charge will not be changed until 1947, and the subsequent rate remains to be announced.

Tin Prices Settled

Increases Announced

THE Ministry of Supply has announced new selling and buying prices for tin. The basic price of tin metal sold by the Non-Ferrous Metals Directorate for delivery in the U.K. has been increased from £300 to £380 10s. a ton. At the same time the basic price of tin metal sold f.o.b. U.K. port for export from the U.K. has been increased from £357 to £380 10s. The basic price is for metal of minimum 99 per cent. to 99.75 per cent. tin content, and prices for all other grades have been varied correspondingly.

The selling price of Straits tin for export is raised from £351 to £372 a ton ex works Penang/Singapore. Further inquiries on these selling prices should be addressed to the directorate of Non-Ferrous Metals, 20 Albert Street, Rugby.

Settlement has now been reached on the purchase price to be paid by the Ministry of Supply for tin concentrates in Malaya, Nigeria, and East Africa. In the case of Nigeria, where the costed contracts with the main producers were terminated at the end of 1945, the price for the first half of 1946 has been fixed at £340 a ton of tin in ore f.a.s. Nigerian port (the Ministry paying ocean freight and insurance and smelting charges). The prices paid in East Africa will be adjusted generally to the new Nigerian levels. In the case of Malayan concentrates the basic tin price from July 1 is £370 a ton at Penang/Singapore smelters.

Stabilised Steel

Royalty-Free Use of U.S. Patents

ALL patent rights in a "stabilised" steel composition designed to meet requirements of increasingly high temperatures in power plants and in the chemical industry have been allocated to public use by the United States Steel Corporation and Carnegie-Illinois.

The use of the material was patented by Dr. Marcus A. Grossmann, director of research, and Dr. R. F. Miller, development engineer, stainless and alloy steels, of Carnegie-Illinois. The patent relates to "the use of a grade of steel particularly resistant to graphitisation when subjected to stress in the temperature range from 800° to 1100°F. According to the patent, the steel alloy developed for this service is of a carbon-molybdenum-chromium composition. The steel embraced in the patent now made available to public use is of the pearlitic, non-air hardening type containing from 0.08 to 0.20 per cent. carbon and from 0.45 to 0.65 per cent. molybdenum in conjunction with from 0.15 to less than 1.0 per cent. chromium, which is proportioned with respect to the carbon content to fix substantially all the carbon in the form of carbide, which is stable within the defined temperature range. It is not only more stable from the standpoint of graphitisation and spheroidisation, but also has a strength equivalent to that of the carbon-molybdenum steel previously used.

NO ALUMINIUM SHORTAGE

At a luncheon given at the Dorchester, London, last week, by the aluminium industry in honour of Sir Edwin Plowden, chief executive of the Ministry of Aircraft Production during the war, Mr. Horace Clarke, president of the Aluminium Development Association, said that recent reports of an aluminium shortage were completely unfounded. If there was a shortage at all it was a merely local shortage of labour. They were fortunate in comparison with other metal industries in that they had ample plant capacity and an adequate supply of the base metal.

ALUMINIUM PRODUCTION

Production of virgin aluminium (all unwrought forms) in the U.K. was slightly lower in the second quarter of 1946 at 8068 long tons, as compared with 8264 tons in the first quarter, according to the Ministry of Supply.

With secondary ingot, excluding recovery from crashed aircraft of 9856 long tons, against 10,358 tons (corrected figure) in the first quarter, total production was 17,924 tons, against 18,622 tons. Scrap yielded 14,924 long tons, compared with 13,765 tons, while consumption was 14,184 tons, against 13,004.

U.K. TIN POSITION

In a summary of the U.K. tin position, the Ministry of Supply notes that stocks in its possession at August 1 were 9658 long tons, to which must be added 2289 long tons produced, making 11,947 in all. Of this, 2680 tons were delivered by way of export, leaving a stock of 9267 tons at July 31.

Consumers' stocks at August 1 were 3498 long tons. Adding deliveries, 2431 tons, and subtracting consumption, 1885 tons, the calculated stock at August 31 was 4044 tons. Actually, 3771 tons were reported held in stock by consumers at that date.

Tin ore (tin content) in stock in the U.K. at August 1 was 6935 tons at August 31, 9049 tons.

Australian tungsten ore has been purchased by France. The Commonwealth's pre-war output was 1000 tons of ore per annum, but it has been increased materially during the war.

Canadian Metal Output

Figures for First Half Year

ACCORDING to a preliminary estimate, especially prepared for our contemporary, *The Mining Journal*, Canada's production of copper, nickel and zinc declined during the first six months of this year, while output of lead, of which metal there is a world shortage at present, has shown an increase. Copper output is estimated at 188,000,000 lb. compared with 258,000,000 lb. in the same period of 1945. Output so far has been about 11,000,000 lb. per month below that of last year. Nickel production registered a serious decline, but during the final months of the first half, a slight recovery was noticeable. Output estimates of 100,000,000 lb. are some 40,000,000 below the 1945 figure. However, a favourable feature of the position is the gradual decline in stocks resulting from war production.

The decline in the production of zinc has been less pronounced; while the monthly average last year was about 46,000,000 lb., an average of 41,000,000 has been reached this year. Lead output has shown an increase with an estimated 188,000,000 lb. for the first half of 1946, as compared with about 168,000,000 lb. last year. Current production of platinum by the International Nickel Co. is estimated at 80,000 oz. a year, comparing with 150,000 oz. for 1945.

PAINTING OF STEEL

The British Standards Institution has issued P.D. 539 : 1946, "Recommendations for Phosphate Coatings as a Basis for Painting Steel," as an interim measure for the assistance of industry. Instructions are given on the method of application of satisfactory coatings and elementary tests of the suitability of the coating are described. Research is now in progress and it is intended to prescribe performance tests as soon as sufficient data is available. Copies of the recommendations may be obtained from the B.S.I., 28 Victoria Street, London, S.W.1 (price 1s.).

REFINING BRASS SCRAP

The Ministry of Supply has entered into arrangements with copper refineries in the U.S. and Canada under which the Ministry will ship for treatment during the next 15 months about 148,500 tons of brass scrap and the refineries will return the copper content as electrolytic copper. The brass scrap is mainly 70/30 ammunition scrap and ingots cast from ammunition scrap. The Ministry expects about 100,000 tons of copper to be returned to this country. The bulk of the contracts have been placed with U.S. refineries.

METAL NOTES

The possibility of establishing an iron and steel industry is being studied by the Egyptian authorities. It would be based on occurrences of iron ores in the Aswan region.

Production of bauxite in Hungary totalled 18,000 tons in the first five months of 1946, equal to an annual rate of 8 per cent of the record production of 1943. Manganese ore output for the first six months totalled 6100 tons, about half the peace-time figure. In the same period, 400 tons of lead ore and about 14,000 tons of copper ore were produced.

Copper consumption in the U.K. during August again showed an increase, the total of 46,827 long tons being 4043 tons above the July total and 7247 above the June total. Unalloyed copper products accounted in August for 21,363 long tons, and alloyed products for 22,681 tons. The balance of 2783 tons was used for copper sulphate.

Iron ore production in Algeria is recovering from the effects of the war; output in June amounted to 125,000 tons, compared with 120,000 and 15,000 tons at the end of the two previous years. Because the Ouenza loading plant was destroyed by enemy action, no increase in exports is likely to take place until it has been replaced. Reserves of high-grade ore are said to be extensive, and efforts are being made to improve methods of production.

Though the occurence of nickel in Spain has been known for a long time, it has never been mined. In recent years, however, the deposits at Carratraca (Malaga) and at Vimbodi (Tarragona) have been exploited, output for the years 1942 to 1944 having totalled 1624 tons of nickel ore, with a mean content of 4 to 7 per cent. The ores are concentrated in the washing plant at Carratraca up to 38 per cent. and two smelting units at Bilbao have yielded mattes and speiss of over 40 per cent. nickel. Spain's domestic nickel needs are estimated at 350 tons yearly.

New Automatic Pipette

Double-Action Precision Instrument

by I. C. P. SMITH, B.Sc., F.R.I.C.

THE principle of a hypodermic syringe in conjunction with a three-way stopcock has already been employed as an automatic pipette for handling serum, etc. (Ayling, *Brit. J. Exp. Path.*, 1924, p. 354), the movement of the plunger being controlled by an adjustable screw stop. Two non-return valves have been used in place of the stopcock. While these pipettes could be calibrated by the user and the screw locked in position, they are not capable of being calibrated or certified by an independent body. The syringe or pump action has, however, many advantages over the ordinary pipette, notably in speed of delivery, as there is no consideration of delivery or drainage time, nor is there an adherent drop to be touched-off from the jet, as the speed of the emergent column of liquid is so high, right up to the moment of cut-off, that this drop is not formed. Once, therefore, that the piston has covered its given stroke, the volume has been delivered with great accuracy of reproduction, and if the piston can be made to work between fixed, *e.g.*, glass, stops, the one disadvantage of the screw adjustment can be overcome.

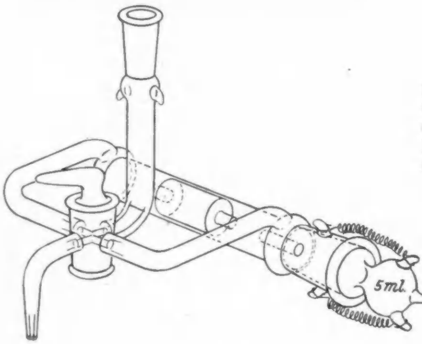


Fig. 1.

The D.S.I.R. pipette, which is purely hand-operated, is one solution of the problem, and another is the double-action automatic pipette which is the subject of the present article.

The pipette is shown in two arrangements in Figs. 1 and 2. Fig. 1 has a four-way stopcock and a 90° movement of the key, and is arranged for attachment to a reservoir by standard-ground joint; while Fig. 2 fits directly, again by standard-ground joint, into the tubulure, as shown also in Fig. 4; it has a 120° key-movement. In either case a delivery is made each time the tap is given its prescribed turn in either direction.

The action of the pipette, it will be seen, depends on the movement to and fro of the piston, which is closely fitting in the barrel, under the pressure of the liquid. On reference to Fig. 3, which represents the form Fig. 1, it will be seen that when the tap is turned to the left, as in (*a*), liquid from the reservoir above, *R*, drives the piston from the left-hand end of the barrel to the right-hand stop attached to the stopper, at the same time forcing under the same pressure-head a volume of liquid before it out of the jet, *J*, the volume being measured by the distance travelled and the piston area. On turning the tap 90° to the right as in (*b*), the movement is reversed; the piston moves to the left, again forcing the measured column of liquid before it out of the jet at *J*. The working positions of the handle of the key are shown at 45° left and right of the jet tube, there being a fully "off" position midway between these over the jet. It will also be apparent that with this type of stopcock the key could be turned 90° at a time in one direction, stopping at each of the similar positions and giving the measured discharge at each.

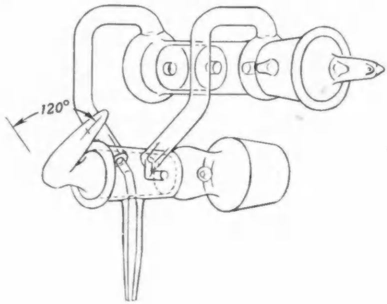


Fig. 2.

The action of the form Fig. 2 is similar to that of Fig. 1, but here the tap movement is 120°, and the handle is in line with one or other upper arm when making a delivery. When the handle is turned down into line with the jet, the aspirator is connected directly with the jet, a useful adjunct for

taking bulk solution, swilling through the jet before using, etc. The stopcock is very robust in construction, being formed in one piece with the cone, and the metering device is in a well-protected position above it. This does not, of course, prevent the aspirator from emptying down to the usual limit at the tubulure. It may be an advantage with this form to apply air pressure to speed operation. With either form of apparatus metal stops may be provided to locate the working positions of the handle; hooks and springs are also required at all joints, and a clip to hold in the key.

Certain details concerning the piston and barrel should be noted; the piston must fit closely, following hypodermic syringe practice, the clearance being of the order of 0.0002 in. No lubricant or sealing device may be used, hence slight leakage may take place past the piston; it is allowed for in the calibration, but for this reason the tap should be turned to an "off" position when out of use. Owing to the close-fitting piston, liquids must be carefully filtered, preferably through sintered glass, and a filter-tube provided to the top opening.

The barrel may be precision-bore or ground out, according to manufacturing preference, but the former is preferable in order to standardise calibration; the flat end forms one stop for the piston, while the other takes the form of a projection or rod on the stopper; all the stops are ground perpendicular to axis at their tips. The final adjustment for volume is obtained by grinding down the length of the stop attached to

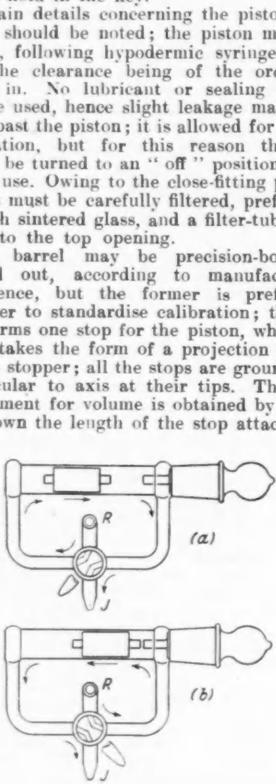


Fig. 3

the stopper. An important point is that by employing standard grinding, stoppers with different lengths of rod may be supplied with one apparatus, the volume being marked for convenience on the stopper. The barrel has a swelling at each end to clear the bore, and the tubes running from the barrel to the stopcock are taken off the tops of these in order to facilitate the removal of air-bubbles when starting up. Fig. 4 shows a pipette complete with aspirator and four extra stoppers, variously calibrated.

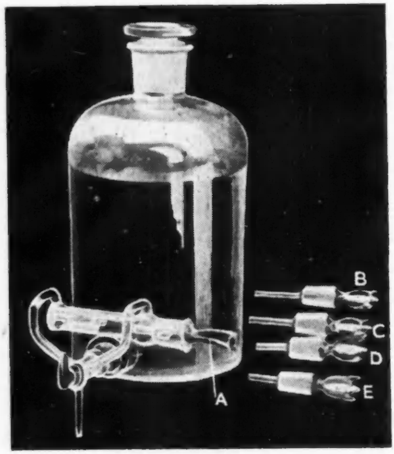


Fig. 4. The pipette complete with aspirators and extra stoppers differently calibrated. (A=10 ml., B=11 ml., C=9 ml., D=5 ml., E=4.5 ml.)

The speed and reproducibility of the pipette are shown by the following test which was carried out by the N.P.L. under controlled conditions: A pipette calibrated for 5 ml. was set up under a head of 24 in. of water. Six receivers were prepared and 6 deliveries made; from the beginning of the first to the finish of the sixth, these took 31 sec. The amounts delivered corrected to 20° C. were :—

4.987 ml.	5.002 ml.
4.986 ml.	5.005 ml.
5.013 ml.	4.996 ml.

The maximum error is seen to be 0.014 ml. N.P.L. Class A tolerance for 5-ml. bulb pipettes is 0.02 ml. The delivery and drainage time of the latter amount to about 30 sec., in addition to the time taken in sucking up and adjusting.

The pipettes have so far been constructed for 25 ml. as an upper limit, and 0.5 ml. as a lower limit of capacity. The former had a delivery time of 10 secs. when set in an aspirator as Fig. 4. This time was halved on applying only 1 lb. air pressure.

The pipette is normally constructed in resistance glass; it is thus proof against all

the usual reagents and is readily cleaned and sterilised.

The author is indebted to Mr. A. J. Targett and Mr. F. F. W. Flaig for valuable suggestions. The principle of operation is patented, and arrangements are being made for the pipettes to be made available through the usual suppliers.

Fuel and the Future

Conference Next Week

SEVERAL papers of particular interest to the chemical and allied industries will be presented at the conference on "Fuel and the Future" which is to be held under the auspices of the Ministry of Fuel and the Fuel Efficiency Committee in London next week.

Among those to be included in the Tuesday afternoon session in the library of the Central Hall, Westminster, from 2-15 p.m.-5 p.m., are: Mr. J. H. Singer, "Freeze Drying in Penicillin Manufacture"; Mr. A. S. White, "Drying of Chemical Products"; Mr. A. C. Hutt, "Factors Affecting Thermal Efficiency of Driers"; Mr. J. C. Lowson, "Electric Infra-Red Drying"; Dr. A. W. Scott, "Drying of Food and Waste Products" Mr. E. H. Farmer, and Mr. C. G. Six, "Spray and Roller Drying"; Mr. W. O. Mead-King, "Drying of China Clay." Eight papers on "Factory Heating and Air Conditioning" will be presented at the Wednesday morning session in the ballroom of the Carlton Hotel, Pall Mall, from 10 a.m.-12.45 p.m., and there will be another session at the same time in the Livingstone Hall, Livingstone House, Broadway, S.W.1, with the general subject "The Coke-Oven Industry." The papers to be given at the Wednesday afternoon session in the Royal Empire Society's building in Northumberland Avenue, W.C.2, from 3 p.m.-5.45 p.m., will be: Mr. B. E. A. Vigers, "Fuel Economy in Relation to Other Factors in the Design of Chemical Factories"; Dr. A. C. Dunningham, "Fuel Efficiency in the Chemical Industry"; Mr. W. F. Gerrad, "Inhibition of Corrosion"; Dr. A. C. Dunningham and Mr. J. H. Chalk, "Fuel Efficiency in the Plastics Industry."

The British Aluminium Co., Ltd., Salisbury House, London Wall, London, E.C.2, announced this week that the prices of raw and fabricated aluminium products have been adjusted in conformity with the recent increase in price of virgin aluminium and the further increases in production costs. In the case of raw aluminium products the new prices are in operation now; those for fabricated products become effective on October 14.

S.C.I. Plastics Group

Chairman's Forthcoming Speech

THE Plastics Group of the Society of Chemical Industry will hold its first meeting of the 1946-47 session next Tuesday, October 8, at Burlington House, Piccadilly, London, W.1, at 6.30 p.m., when Mr. N. J. L. Megson will deliver the chairman's address under the title: "Recent Advances in Plastics."

Mr. Megson will speak of the influence of the war on developments in the high polymer field, including special materials to meet exceptional Service requirements, *e.g.*, Polythene as a flexible high-frequency dielectric; ion-exchange resins for producing potable water from sea-water; P.V.C. and synthetic rubbers, etc., as substitutes for natural rubber. He will also deal with new materials such as silicones, diallyl and other doubly unsaturated resins, vinyl co-polymers, etc., and new types of plasticisers for thermoplastics used at low temperatures. Special processes, such as low-pressure moulding, post-forming of laminated stock, use of high frequency heating, welding, etc., will be surveyed and fundamental work described on the constitution of phenolic resins, kinetics of resin reactions, relation between structure and properties, and strength of laminated stock. Finally, Mr. Megson will describe certain German developments on polyurethanes, polyvinyl carbazole, "Koresine," "Luvitherm" process, acetylene chemistry, Buna, etc.

German Technical Reports

Latest Publications

SOME of the latest technical reports from the Intelligence Committees in Germany are detailed below. Copies are obtainable from H.M. Stationery Office at the prices stated.

CIOS XXX—109. *Hydrogen peroxide storage practices in three German plants* (2s.).

BIOS 495. *Copper and copper base alloy tube manufacture* (5s.).

BIOS 633. *I.G. Farben, Bitterfeld*: Manufacture of oxalic acid (1s. 6d.).

BIOS 679. *I.G. Farben, Bitterfeld*: Manufacture of potassium dichromate and chromic acid (2s. 6d.).

BIOS 680. *I.G. Farben, Wolfen*: Manufacture of caustic soda, chlorine and HCl (4s.).

FIAT 273. *Interview with Dr. J. W. Reppe, I.G. Farben, A.G.*: Acetylene chemistry (2s.).

FIAT 522. *The beryllium industries of Germany and Italy* (1939 to 1945) (9s.).

FIAT 737. *Economic study of German synthetic waxes* (3s.).

Wool Wax Alcohols—II*

Further Industrial Uses : Some Reaction Products

(*Continued from* THE CHEMICAL AGE, *September* 28, 1946, *P.* 375.)

IMPROVEMENT of lubricating oils and greases offers other examples of the many uses for these alcohols. One process incorporates, into lubricating oils, wool wax alcohols plus alkaline or alkaline earth soaps in proportions from 0.5 to 2 per cent. Thirty parts of this mixture of alcohols and soaps (1 : 1) added to 70 parts of lubricating oil gives a good consistent grease. An emulsified solid grease, particularly suitable for the lubrication of axles and trucks, tubs, etc., is characterised by the feature that the oil from which it is prepared is first treated, to produce partial polymerisation, to electric glow discharges and is then mixed with up to 5 per cent. water, using wool wax alcohols to assist emulsifying.

A lubricating preparation for preventing corrosion of metal working parts by liquids or vapours, consists of a lubricating oil, plus both a blown oil and wool wax alcohols, with one or more heavy metal soaps, such as aluminium, calcium, cobalt, thallium, etc. Such a lubricant is capable of absorbing corrosive liquids, forming water-in-oil emulsions. Lubricants of this type can be used on sulphur dioxide pumps, acidic solution pumps, and especially rock drills as used in mines.

The general properties and chemical characteristics of wool wax alcohols indicate that on technical grounds they might find application in the paint and related industries as emulsifying, dispersing or flatting agents or as plasticisers. A preliminary survey of the potentialities of the material was therefore made under these headings.

Emulsions

In experiments to evaluate the emulsifying powers of wool wax alcohols it was not possible to make stable O/W bitumen materials using wool wax alcohols alone (up to 5 per cent.); but fixe varnish, *i.e.*, linseed oil/congo varnish base without thinner, emulsified readily with wool wax alcohols alone, to give very stable W/O emulsions. In the presence of ammonium oleate these emulsions reversed and fairly stable O/W emulsions were obtained. This emulsion on aging and also on grinding with difficult pigments was found to be much more stable than a similar material prepared from ammonium oleate alone, but not equal to an emulsion prepared with ammonium oleate and glue, as in a normal oil-bound distemper.

* Abridged from *Wool Wax Alcohols in Industry*, by E. S. Lower, technical director of Croda Ltd., Croda House, Snaith, Goole, Yorkshire.

The dispersing powers of wool wax alcohols have been examined in linseed oil and linseed stand oil, using lithopone and lemon chrome pigments and compared with lecithin as a control. The general conclusion is that wool wax alcohols improve the dispersing properties of linseed oil to a rather lesser extent than lecithin; neither wool wax alcohols nor lecithin brings linseed oil to the level of stand oil. Addition of wool wax alcohols to stand oil does not greatly affect its already good dispersing properties. In general, wool wax alcohols perform better with lithopone than with lemon chrome.

Textile Uses

One of the chief drawbacks to the use of paraffin and hydrocarbons generally as lubricants for textiles has been the difficulty of effectively removing them, but a lubricant consisting of paraffin wax, wool wax alcohols and a solution of sodium octadecanoyl methylaminoethane sulphonate, in the form of an emulsion, is claimed to be free from such difficulties. The presence of the fatty alcohols is given as the reason for the considerably higher lubrication obtainable and, in part, for the ease of removal.

Small amounts of cholesterol, or wool wax alcohols, added to mineral wool-combing oils, will enable such oils to be washed from fibres. Oils so blended have been found to give residual oil figures not greatly different from those of olive oil when tested similarly.

Textile materials, especially those having a basis of cellulose, may be much improved by the presence of fatty alcohols, particularly wool wax alcohols. Such alcohols render the material more amenable to knitting and other mechanical operations, and dyeing and delustring operations are greatly facilitated. A given example of the manner in which these alcohols may be applied contains acetone soluble cellulose acetate in 2.5 times its weight of an acetone/water mixture (95 : 5); and to this mixture is added 10 per cent. by weight (on the cellulose) of wool wax alcohols, the charge being mixed, filtered and spun. Lubricants for cellulose acetate yarns, comprising mixtures of 45 per cent. mono-ethyl ether of diethylene glycol, 45 per cent. of diethylene glycol and 10 per cent. wool wax alcohols, are a protected article, and benefits to be derived by their use include their good solvent action on fugitive colours, and the fact that deep shades are obtainable with minimum amounts of dyestuff. Other claimed improvements deal with the knitting of yarns

and also that the products yield fabrics of soft handle and freedom from scroop.

Wool wax alcohols have been found suitable for inclusion in non-adhesive thickening agents, used, for example, in combination with colouring matter in producing pastes for printing on various fibres including silk, wool, cotton, etc. These thickening agents are illustrated by the following example: 500 parts of water are stirred at 50-80° C. with 50 parts fatty alcohol and 5 parts of sodium stearylsulphonate, giving a firm stiff paste. Of this 20 to 40 per cent. may be used in the printing composition.

Some Uses of Reaction Products

The alcohol mixture obtained from wool wax has been found to be suitable starting material from which to prepare metal alcoholates, designed, in the first instance, for inclusion in paint-, lacquer-, and varnish-removing gels. The alcoholates are obtainable by known methods or, in so far as they are new compounds, produced analogously to the known higher alcohols. These alcoholates are worked up into gel-like compositions with paint-removing solvents. Different metals give different qualities of product, of course, and some have been found useful as stiffening agents for waxes or candles, for insulating purposes, etc.

Anti-rachitic materials are a great stride from paint removers, but this only serves to emphasise the many-sided nature of the products under discussion. It has been noted earlier that substances having anti-rachitic properties may be obtained by subjecting appropriate steroids (including sterols and derivatives of sterols such as esters, ethers and hydrocarbons) to the action of compositions containing sulphuric acid and acetic anhydride at relatively high temperatures. It is not essential to employ pure Liebermann-Burchard steroids such as cholesterol or ergosterol, as wool wax mixed alcohols are given in one example, patented in the U.S., as specific starting materials. In this example the alcohols were mixed with acetic acid, into which mixture sulphuric acid was gradually poured, followed by the anhydride, after which the mass was heated for three hours at 93° C., the acetic acid being removed under vacuum and the washed residue neutralised with lime, yielding a product of a potency of 425 A.O.A.C. units per gram. Similar results have been obtained by simply irradiating the alcohols, when, according to a German patent, the creation of a vitamin-*D* content is claimed.

Wool wax alcohols are mentioned as reactants in the making of condensation products from aminotriazine by reaction with compounds containing one alcoholic group and an aldehyde. Here finely ground melamine, formaldehyde, and a little hydrochloric acid are heated to solution, and wool wax alcohols are added and the whole heated once more for an hour or so, yielding glass-clear or white viscous liquids or pastes. The markets for such products are to be found in the textile, wool, paint and paper industries for use as binding agents, impregnating agents, drying oil additives, etc.

A rather different type of condensation product—the water-soluble sulphonated derivatives—is produced with the aim of overcoming many disadvantages attending the straight sulphonated alcohols. Essentially, the process for their production consists of first esterifying the alcohols with boric acid and subjecting the boric esters or borates so formed to treatment with a sulphonating medium in the presence of other boric esters or borates. In these latter, however, aliphatic alcohols contribute the alkyl radical, *e.g.*, sperm oil alcohols or oleyl alcohol are employed instead. The compounds formed, after neutralisation in the usual manner, are dissolved very easily in water, giving weakly yellow solutions; they are excellent wetting, washing, and especially softening agents for textiles, leather, etc., and for improving soaps.

It has been suggested, following the extensive investigations of Lifschutz, from 1908 onwards, and as a result of work done on the unsaponifiable matter of sewage greases, which contains a quantity of cholesterol and other wool wax alcohols, that by heating this unsaponifiable mass to about 400° C. with small quantities of caustic soda or copper sulphate, two molecules of the contained sterol components are mildly dehydrated to form an ether, a condensed product, as a result of which drying properties are imparted to the waxy matter, thus making it suitable for substitution of varnish oils, etc.

Esters and Ethers

Of the various esters synthesised from wool wax alcohols, the phosphoric acid esters are found of use in lubricants for high-pressure work. A special feature of these is that they contain substances which are able to react with the metals on the surfaces to be lubricated to form thin layers of chemical compounds which serve to improve lubrication, as they are continually swept away by friction and replaced by new layers of the order of molecular dimensions. In contradistinction to other known additives for this purpose, the phosphoric acid esters do not cause subsequent corrosion of the lubricated surfaces. The preparation of the esters requires the melted alcohols to be stirred with phosphorus pentoxide at 70° C., then left until separation into two layers takes place, when the upper one is decanted and contains free anhydride and esters, blendable with lubricating oils. The products may be formed in the oils. Wool wax acetates and formates have been used similarly.

Other phosphoric derivatives are involved

in a process for the manufacture of textile agents or leather auxiliaries by treatment of the alcohols in the presence of the soap formed in their manufacture by saponification, with phosphorus trichloride. The products are converted into glyceryl esters and sulphonated. Water-insoluble boric acid esters of wool wax alcohols are produced if the alcohols are heated with boric anhydride. These are soluble in organic solvents, however.

Other Uses

Ethers of wool wax alcohols have been prepared and used for textile cleansing, dyeing, finishing, in a sulphonated form, and in admixture with ethers of alcohols with less than six carbon atoms. Small additions of these chemicals are said to improve the washing properties of salts of the type trisodium phosphate, or water-glass.

Preparations having the constitution of ethers, again mainly intended for the textile mills, are obtained when fatty alcohols, including wool wax alcohols, are introduced over a period of an hour, into ethionic acid at 40-50° C., while stirring, which is continued until test samples are soluble in water, when the mass is converted into sodium or ammonium salts, very suitable apparently for use as soap substitutes.

Wool wax alcohols freed of agnosterol and lanosterol have been acetylated and subsequently treated with sodium glycerate or glycolate and the ether formed separated, purified, dried and sulphonated, giving derivatives of excellent cleansing power. This is stated to be a very smooth way of obtaining wool wax ethers.

Water-soluble phenolic compounds of wool wax alcohols may be obtained by heating reacting proportions with the hydrohalides of sulphonic acid salts of complex phenolic amines (obtained by condensing phenol, formaldehyde and secondary amines). Such materials are described as emulsifying, dispensing, tanning and germicidal agents.

The unsaponifiable components of wool wax have been used in processes resulting in colloidally water-soluble compounds useful as soap substitutes, by reaction (with or without the aid of solvents), with sodium metal, giving brown waxlike substances. Resins prepared from wool wax alcohols by heating with rosin, glycerine, and metallic oxides above 200° C. are said to have good solubility and to give varnishes of good film strength and flexibility.

The sulphonation of wool wax alcohols has been achieved by various methods, including, for instance, a method wherein the alcohols are mixed with 98 per cent. sulphuric acid and gradually heated to 100° C. At the same time acetic anhydride is admixed, the mixture being kept well stirred for several hours, after which time the mass is poured into ice water and the reaction products washed after addition of sodium sulphate, when they may be converted to their alkali salts. Another process converts the alcohols first to their acetates, then sulphonates these compounds with oleum or chlorosulphonic acid. Textile and leather manufacturing plants are given as the consuming industries for these products, suitable for emulsifying, moistening, and cleansing.

Sulphonation products of wool wax alcohols which are simultaneously esters and sulphonic acids are known. These are prepared by direct reaction of the alcohols with polysulphonic acids of aromatic hydrocarbons, stoichiometrically, so that finally the products still contain one unesterified sulphonic group. An illustration of this process first prepares naphthalene disulphonic acids by reactions of oleum and naphthalene, which are subsequently mixed with the fatty alcohols, keeping the temperature below 35° C. The sulphonates so formed are introduced into ice water and neutralised with soda lye. These sulphonates serve as wool washing agents and are claimed to have extraordinary stability, being completely stable to the hardest waters, inorganic and organic acids, and multivalent metal salts without precipitation. They have also been used as starch dispersing agents and matt finishing agents with pigments.

Classifying Literature

System Sought in U.S.A.

THE United States Patent Office, Department of Commerce, has invited the nation's inventors to come forward with a new system of classifying technical literature, which is now multiplying at such a rapid rate that it threatens to throttle not only the work of the Patent Office, but of scientists and inventors as well.

Existing systems of classifying human knowledge are hopelessly inadequate to meet modern needs, according to the Commissioner of Patents. The result is that an increasingly large body of technical scientific information cannot be classified so that it can be utilised to the fullest extent. Scientists and inventors are often hampered in their work by having to grope their way through the increasingly great bibliographical disorder in the various fields in which they are interested.

In the early days of the patent system, inventions were for the most part simple, few in number, and easy to classify. In 1836, when the present patent system was set up, all patents were organised under 16 general classifications. Since then nearly 2,500,000 patents have been issued and new patents are pouring in at the rate of 8000 a month as the pace of technical development throughout the industrial world moves ever faster.

Personal Notes

MR. A. RYRIE has been appointed to the board of J. & J. Colman, Ltd.

MR. J. H. ENNION has been appointed a director of Metal Industries, Ltd.

MR. C H. HUTTON-WILSON has been elected a director of Eaglescliffe Chemical Co., Ltd.

MR. L. B. ROBINSON and MR. H. V. CASSON, alternative directors of National Fertilizers, Ltd., have resigned from the board.

MR. WILLIAM STEWART is resigning his directorship of Stewart & Lloyds, Ltd., on November 30, after 49 years' service with the company.

MAJOR C. J. P. BALL, MR. T. F. A. BOARD, MR. R. S. CUMMING, and MR. C. F. MERRIAM have been appointed directors of the Distillers Co., Ltd.

MR. W. O. MEADE-KING, a director of English Clays Lovering Pochin & Co., Ltd., is flying to Tanganyika to inspect big deposits of china clay at Pugu Hills, 20 miles from Dar-es-Salaam.

In the University of St. Andrews, MR. D. M. G. LLOYD has been appointed lecturer in chemistry at United College, and MR. J. L. COPP, lecturer in chemistry at University College, Dundee.

MR. E. S. WADDINGTON, of Philips Industrial (Philips Lamps, Ltd.), who has been appointed vice-chairman of the finance committee of the Institute of Welding, has been a member of the Council of the Institute for some time. He has also been appointed to the Council of the Sheet & Strip Metal Users Association.

DR. F. HEATHCOAT, vice-principal and head of the department of chemistry and metallurgy at Swansea Technical College, has been appointed principal of the Barnsley Technical College. Dr. Heathcoat is B.Sc. of Sheffield University; after graduating he spent five years in research on organic chemistry and coal chemistry, obtaining his Ph.D. in 1930 and M.Sc. in 1938

DR. WESLEY COCKER, who has been senior lecturer in chemistry at King's College, Newcastle, for the past seven years, and was formerly a lecturer in chemistry at University College, Exeter, has been appointed to the chair of General Chemistry, which carries with it Directorship of the Department of Chemistry, at Trinity College, Dublin. He takes up the new appointment on January 1.

MR. D. P. C. NEAVE has been appointed a director of Fisons, Ltd., in place of MR. L. B. ROBINSON, resigned. Mr. Robinson, who has also resigned his position as managing director of the Imperial Smelting Corporation, Ltd., has been appointed managing director of the Zinc Corporation, Ltd., jointly with MR. W. S. ROBINSON, and managing director of New Broken Hill Consolidated, Ltd.

DR. GEORGE J. JANZ, of Winnipeg, who has been awarded an I.C.I. fellowship by the University of London, was a member of the central research laboratory of Canadian Industries, Ltd., at McMasterville, Quebec. He will continue research in the department of chemistry at the University of London, where he will remain for a term of at least three years. He is a graduate of the University of Manitoba and the University of Toronto.

DR. W. J. DONALDSON, lecturer in chemistry at the Constantine Technical College, Middlesbrough, and formerly chemistry master at the Royal High School, Edinburgh, has been appointed lecturer in chemistry at Robert Gordon's Technical College, Aberdeen. Dr. Donaldson received the degree of Ph.D. for research work on physical and colloid chemistry carried out at Edinburgh University. During the war he was seconded for special service with I.C.I.

Belgian Chemical Notes

Glass Exports Up

THE Belgian glass industry continues to work at the maximum rate allowed by restricted fuel supplies, and exports of window glass have increased considerably.

In the bottle manufacturing branch, fuel shortages are being overcome by the conversion of furnaces from coal to oil, and within recent weeks new oil-fired furnaces have been put into operation at the Verreries du Pays de Liége et Campine at Moll and the Verreries Bennert et Bivort at Jumet. A trade agreement has just been signed with Denmark, under which Belgium will deliver miscellaneous glass and glassware to the value of 18,250,000 francs in exchange for ammonium sulphate, photographic products, electrolytic copper, and metallic products.

The Allied Control Authority has allocated to Belgium the Fabrik Hess-Lichtenau chemical and explosives factory (Hesse) under the reparations agreement.

The refractory industry is being severely restricted by lack of the requisite earths, imports from France having fallen away almost to nothing. The position is so serious that only two firms were able to quote in response to a recent application for tenders by the State Railways for 39-42 per cent. qualities. On the other hand, manufacturers are complaining that British firms are now quoting for deliveries to Belgium at prices c.i.f. Antwerp considerably lower than domestic prices.

General News—————From Week to Week

The offices of the Iron and Steel Board have now been established in Bush House, Strand, London, W.C.2. The first meeting of the Board was held in London on Tuesday.

The Council of Industrial Design has decided that the "Britain Can Make It" exhibition shall remain open in London until the end of November, so great has been the public interest.

The Film Committee of the Association of Scientific Workers has recently issued a pamphlet, *Notes on The Formation of Scientific Film Societies*, copies of which can be obtained from the head office, 15 Half Moon Street, Piccadilly, London, W.1.

Boiler-house and maintenance personnel who have profited from previous publications in the Fuel Efficiency series issued by the Ministry of Fuel will be interested in *The Installation and Maintenance of Boiler-house Instruments*, the latest addition to the series, free copies of which are obtainable from Ministry of Fuel regional offices.

Ex-Service employees of the Castner Kellner Works, I.C.I., Runcorn, were recently entertained to a tea and social evening by the Works Social Service. Mr. V. St. J. Killery, chairman of the general chemical division, said the division had a large programme of construction and rehabilitation, which would take five years to complete.

To conserve supplies of silver for industry, and to avoid the high cost of importing silver, a Bill is to be introduced early in the next parliamentary session to permit the minting of cupro-nickel coins in place of silver. Silver coins now circulating would be called in for melting as the new currency becomes available.

The new session's programme of the Textile Institute opened last week with an address on "Modified Fibres" by Professor Speakman, of Leeds. Subsequent meetings will deal with such chemical aspects of textile technology as proteins, plastics, and glass yarns and cloths; dust-control and scientific factory lighting are also among the subjects to be covered.

Addressing Glasgow Rotary Club, Mr. William Sinclair, vice-president of the Scottish Motor Trade Association and the Dunlop Rubber Co.'s regional manager for Scotland, said he had often been told that Russia made all her own war-time tyres from "substitutes like dandelion juice." Actually, her war-time tyres were made in Britain and America. He felt that not enough recognition had been given to the war-time work of the "back-room boys" in Britain and America—the rubber chemists and technicians—in producing a synthetic substitute.

By a new agreement between the Government of the U.K. and the U.S.A. announced on Tuesday, the U.S. undertakes to purchase an additional 200,000 tons of natural rubber between now and the end of the year. Stocks in this country will be drawn on to the extent that purchases cannot be made good from Malaya.

A strike involving 600 workers at the Shawfield Chemical Works of J. & J. White, Ltd., Rutherglen, has been reported from Scotland. Employees are objecting to a number of dismissals on grounds of redundancy, and to the retention of non-union workers. The company states that a reconstruction scheme in the furnace department implies the dismissal of about 80 men.

The chairman of East Pool & Agar, Ltd., the Cornish tin-mining company, has announced that the C.I.C. has refused permission for the issue of fresh capital; he is therefore of opinion that there is now little alternative but liquidation, as it will probably be a long time before the Ministry of Fuel's committee inquiring into metalliferous mining can give positive results.

Sir Stafford Cripps, President of the Board of Trade, will, in the next session of Parliament, introduce a bill to reform company law. The bill will carry into effect the changes suggested in the Cohen Committee's Report, and will cover a number of matters, including nominee shareholders, misleading company names, payment of directors, contents of prospectuses, and publication of accounts.

Kidderminster Town Council has agreed to sell for £6080 a site of 16.75 acres to Johnson, Matthey & Co., Ltd., who propose to erect a factory for the refining, smelting and rolling of special metals. Ultimately it is hoped that 250 men will be employed at what is described as a "primary producing unit." The Board of Trade will grant the necessary facilities to erect buildings on an area of 50,000 sq. ft., including offices, with provision for future extensions, and it is estimated that it will take eighteen months to two years to complete.

Foreign News

The opening date of the next Brussels International Commercial Fair has been fixed for May 12, 1947.

The Australian Government is to spend £3,000,000 in the search for oil, mainly in the Kimberley area of North West Australia.

U.S. consumption of copper during August was the biggest for any month in a year and a half. It represented an increase of 22,901 tons over the July figure of 96,743 tons.

It is hoped to increase Spitzbergen's coal output, which will amount to about 50,000 tons this year, to 300,000 tons in 1947, with a further increase to 800,000 by 1948.

Recovery in Greek industry made considerable progress in July, when output of the chemical industry reached 41 per cent. of the 1939 figure.

The board of the Attock Oil Company report that oil has been struck at a new field 12 miles from Joya Mair in the Punjab at a depth of 8200 ft. Initial results give a production of 350 barrels daily.

The production of pig iron in the British zone of Germany during August was the highest of any month since the occupation. Steel production also increased, so that the record figures achieved in July were exceeded.

Owing to the manpower position, the production capacity of Sweden's iron and steel industry cannot be fully made use of. The fuel position has recently improved, but is still not quite satisfactory.

The Norwegian Government proposes shortly to resume commercial exchanges with Germany. It will supply the Soviet zone with sulphur and fishing products in exchange for machinery and potash.

A deposit of calcite, which is reported to contain over 5,000,000 kg. of the mineral, of a remarkably high quality, has been discovered in the Brazilian state of Goiás, near the town of Matauna, only a few miles from a main road-transport route.

A new electrolytic method of extracting manganese from United States low-grade ores has been developed by the U.S. Bureau of Mines. It may in time become possible to produce manganese cheaply enough to compete with imported ores.

The second Congress of the Pan-American Institute of Mining Engineering and Geology is being held in Rio de Janeiro in the first half of October. There will be excursions to Minas Geraes, to S. Paulo and to the coal-mines in Santa Catarina and Rio Grande do Sul.

Recent borings for oil in the area around Salvador, in the Brazilian state of Bahia, have given extremely encouraging results. The most promising, according to the Rio correspondent of *The Times,* is expected to yield 1500 barrels of petroleum daily, and the Government is to build a local refinery with a daily capacity of 2500 barrels.

Purchases of the French Supply Mission at Buenos Aires during the year ended June 30 included 30,090 tons of quebracho extract, 575 tons of casein, 7794 tons of industrial oils, 153 tons of tungsten, 5200 tons of wolfram, 60 tons of cellulose, 397 tons of glycerine, 18,387 tons of flax-seed, 2145 tons of industrial tallow, and 5200 tons of zinc.

An interesting outcome of the St. Erik's Fair at Stockholm has been the reappearance, after six years, of the journal *Frankrike-Sverige,* published by the French Chamber of Commerce in Sweden with a view to encouraging trade between the two countries concerned.

Production of the group of Canadian industries making chemicals and allied products had an aggregate value of $472,300,000 in 1945, according to a preliminary estimate by the Dominion Bureau of Statistics, showing a sharp decline of 35 per cent. from the total of $730,900,000 in 1944. About 983 establishments were in operation in this group in 1945, employing an average of 60,000 workers throughout the year.

The demand for products of Shawinigan Chemicals, Ltd., in Canada, has necessitated operation of the plant at a high level of capacity, but restrictions in the supplies of steel and other raw materials have, to a certain extent, curtailed production of some items. The subsidiary concern of Canadian Resins and Chemicals, Ltd., has begun production of "vinylite" plastics in a new plant.

The suggestion that the Antarctic regions contain large uranium deposits was recently put forward by Sir Douglas Mawson, head of the geological department of Adelaide University, when addressing the Australian and New Zealand Association for the Advancement of Science. He maintained that these regions resembled those districts of Northern Canada where uranium ores were found.

Allocations of crude rubber to essential consumers in Italy still leave much to be desired, but to judge from the capacity and degree of activity of the two principal manufacturing concerns, Pirelli and Michelin, production conditions are rapidly becoming normal in the rubber industry. Deliveries promised by UNRRA (15,000 tons of natural and 15,000 tons of synthetic rubber) will allow the production of more tyres than the country produced in the last pre-war years.

Forthcoming Events

October 7. Oil and Colour Chemists' Association (Hull Section). Royal Station Hotel, Hull, 6.30 p.m. Mr. G. H. Harries: "The Evaluation of Crude Petroleum Oils."

October 7. Society of Chemical Industry (Yorkshire Section). Leeds University, Woodhouse Street, Leeds, 7 p.m. Professor J. B. Speakman: "The Newer Synthetic Fibres."

October 7. Society of Chemical Industry (London Section). Chemical Society's rooms, Burlington House, Piccadilly, London, W.1, 6.30 p.m. Dr. W. H. J. Vernon:

"Chemical Research and Corrosion Control: Some Recent Contributions of a Corrosion Research Group."

October 8. Society of Chemical Industry (Plastics Group). Burlington House, Piccadilly, London, W.1, 6.30 p.m. Mr. N. J. L. Megson: "Recent Advances in Plastics."

October 8. Institution of Chemical Engineers. Geological Society's Rooms, Burlington House, Piccadilly, London, W.1, 5.30 p.m. Mr. D. G. Murdoch and Mr. M. Cuckney: "The Removal of Phenols from Gas Works Ammoniacal Liquor."

October 9. Association of British Chemical Manufacturers. Grosvenor House, Park Lane, London, W.1. Annual dinner, 7-7.30 p.m.

October 8. Hull Chemical and Engineering Society. Church Institute, Albion Street, Hull, 7.30 p.m. Mr. J. N. Blake, Mr. C. E. Rhodes, Dr. E. Downing, Mr. R. Lyth: "Notes on Analytical Technique."

October 10. Oil and Colour Chemists' Association (London Section). Royal Institution, 21 Albemarle Street, London, W.1, 6.30 p.m. Professor H. W. Melville: "The Chemistry of High Polymers—II."

October 10. Society of Chemical Industry (Plastics Group, jointly with Bristol Section). Bristol University, Woodland Road, Bristol, 5.30 p.m. Mr. N. J. L. Megson: "Recent Advances in Plastics."

October 11. Society of Chemical Industry (Chemical Engineering Group). Geological Society's Rooms, Burlington House, Piccadilly, London, W.1, 5.30 p.m. Mr. R. Scott, A.M.I.Chem.E.: "Chemical Engineering in the Tar Industry."

October 11. Society of Public Analysts (Physical Methods Group, jointly with Cardiff and district section of the Royal Institute of Chemistry and South Wales section of the Society of Chemical Industry). University College, Cathays Park, Cardiff, 6.30 p.m. Mr. A. D. E. Lauchlan: "Recent Developments in Apparatus for *p*H Measurement and Electro-titrations"; Mr. R. J. Carter: "Some Applications of Electrometric Methods of Analysis"; Dr. D. P. Evans: "Polarisation End Points."

October 15. British Society for International Bibliography. Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2, 2.30 p.m. Dr. B. M. Crowther: "The Use of the Universal Decimal Classification in Periodical Abstracting Services for Scientists and Engineers"; Dr. S. C. Bradford: "The Problem of Complete Documentation in Science and Technology."

October 16. Society of Chemical Industry (Agriculture Group). Physical Chemistry Lecture Theatre, Royal College of Science, South Kensington, London, 2.30 p.m. Dr. F. Gross: "An Experiment in Farming the Sea."

October 16. British Association of Chemists (Liverpool section, jointly with the Association of Scientific Workers). Stork Hotel, Queen Square, Liverpool, 6.45 p.m. Conference on "Salaries and Working Conditions in the Chemical Industry." Speakers: Dr. McMorgan, chairman, Manchester branch, A.Sc.W.; Mr. F. Crone, area organiser, A.Sc.W.; Mr. Stewart Cook, organising secretary, B.A.C.; Mr. H. H. Hutt, chairman, Liverpool section, B.A.C.

October 17. The Chemical Society. Municipal College, Southampton, 7 p.m. Dr. H. J. Emeléus: "Chemical Aspects of Work on Atomic Fission."

October 17. The Chemical Society. The University, Western Bank, Sheffield, 2.30 p.m. and 6 p.m. Professor Jaroslav Heyrovsky: "The Principles and Applications of Polarography."

October 17. Oil and Colour Chemists' Association (London Section). Royal Institution, 21 Albemarle Street, London, W.1, 6.30 p.m. Professor H. W. Melville: "The Chemistry of High Polymers—III."

October 17. The Chemical Society. Burlington House, Piccadilly, London, W.1, 7.30 p.m. Mr. R. A. Baxter, Mr. G. T. Newbold and Mr. F. S. Spring: "Pyrazine Derivatives"; Mr. L. J. Haynes, Mr. E. R. H. Jones and Mr. M. C. Whiting: "Researches on Acetylenic Compounds : Acetylenic hydroxy-acids and their Reactions."

October 18. Association of Special Libraries and Information Bureaux (Northern Branch). Hornby Library, William Brown Street, Liverpool, 3, 3 p.m. Mr. A. B. Agard Evans: "Information Service and the Export Trade."

Company News

The directors of **Imperial Chemical Industries, Ltd.,** announce that they have declared an interim ordinary dividend of 3 per cent. (actual) in respect of the year ending December 31, 1946.

The nominal capital of **Scottish Laboratories, Ltd.,** London, W, has been increased beyond the registered capital of £5000 by the addition of £5000, divided into 6 per cent. cumulative preference shares of £1 each.

Metal Traders, Ltd., report net profit of £9545 for the year ended March 31 last, as compared with £7027 for the previous year. The dividend per unit has been increased from 6d. to 9d.

James M. Brown, Ltd., manufacturers of chemical and other products, etc., London, W.C.2, have increased their nominal capital

beyond the registered capital of £100 by the addition of £49,900, divided into 998,000 ordinary 1s. shares.

Fairbank Kirby (Wholesale) Ltd., chemical manufacturers, etc., Grimsby, has increased its nominal capital beyond the registered capital of £1000 by the addition of £5000, divided into 5 per cent. cumulative redeemable preference shares of £1 each.

Although the net profit of **Murex, Ltd.,** for the year ended June 30 last was substantially less than for the previous year—£201,489, as against £213,032—a final dividend of 10 per cent., plus a cash bonus of 2½ per cent., has been declared for the tenth successive year, thus bringing the total payment for the year up to 20 per cent.

Details have been issued of Treasury-sanctioned capital issue by **Petrocarbon, Ltd.,** to provide finance for its subsidiary, Petrochemicals, Ltd. (see p. 405). The share capital of Petrocarbon, Ltd., is £82,500, of which £75,000 is £1 6 per cent. preferred ordinary shares and the balance in ordinary 1s. shares. This has been provided. Loan capital consists of 4 per cent. registered notes totalling £1,800,000, one-half of which is in "A" notes and the other "B" notes. The whole of the "A" notes, ranking before the "B," will be subscribed at par by the Finance Corporation for Industry, while the "B" notes are being placed privately.

New Companies Registered

Ferro Metal & Chemical Corporation, Ltd. (420,049).—Private company. Capital £10,000 in £1 shares. Dealers in metal ores, chemicals, and plastics, etc. Director: J. L. Holt. Registered office: 2/5 Old Bond Street, W.1.

Kent Laboratories, Ltd. (419,446).—Private company. Capital £100 in £1 shares. Manufacturing and general chemists, etc. Directors: D. Glass; Mrs. V. E. A. Wilmin; Miss J. Penn. Registered office: 2-5 Old Bond Street, W.1.

Secto Company, Ltd. (418,845).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in insecticides, distinfectants, chemicals, acids and fertilisers, etc. Directors: E. Woolley, W. E. Woolley. Registered office: Phoenix Mill, King Street, Blackburn.

Stronghold Industries, Ltd. (418,857).—Private company. Capital £5000 in £1 shares. Manufacturers and dealers in plastic substances, synthetic resins, chemicals, fertiliers, etc. Directors: E. B. Thompson; D. W. R. Andrew. Registered office: 104 High Street, Winsford, Ches.

United London Overseas Trading Corporation, Ltd. (419,586).—Private company. Capital £500 in £1 shares. Manufacturers of and dealers in chemicals, waxes, steel, iron, rubber, plastics, etc. Director: A. Brimson. Registered office: 33 Warwick Avenue, W.9.

Technopol Plastics, Ltd. (419,391).—Private company. Capital £10,000 in £1 shares. Manufacturers of and dealers in hard and soft plastics, etc. Subscribers: W. C. Summer; Leo. Edgard. Registered office: 120 Pall Mall, S.W.1.

Union Chemical Co., Ltd. (419,486).—Private company. Capital £1,000 in £1 shares. To carry on business as indicated by the title. Directors: P. Manovill; I. Spitzer; F. J. Shopland. Registered office: 10/11 Fetter Lane, E.C.4.

Lamberts (Langley Mill), Ltd. (419,049).—Private company. Capital £2000 in £1 shares. Manufacturing research chemists, etc. Directors: J. C. O. Hallam; E. Pilkington. Registered office: Valley Works, Langley Mill, near Nottingham.

Plastic and Chemical Products (Surbiton), Ltd. (419,207).—Private company. Capital £2000 in £1 shares. To carry on business as indicated by the title. Subscribers: E. R. Baker; W. T. Frere. Registered office: Elm Road, Hook, Surbiton, Surrey.

W. J. E. Gould, Ltd. (419,083).—Private company. Capital £3000 in £1 shares. Wholesale and retail chemists, etc. Directors: F. Holden; E. Muldowney; J. Whitehouse. Registered office: 1 Broad Street, Teddington, Middlesex.

Wax Products, Ltd. (419,491)—Private company. Capital £1,000 in £1 shares. Chemists, druggists, dyers, manufacturers of and dealers in natural and synthetic waxes, etc. Directors: D. C. Westbury; L. G. Parsons. Registered office: 158-168, Kensal Road, London, W.10.

Slinter Mining Company, Ltd. (418,850).—Private company. Capital £1000 in £1 shares. To search for, raise and work barytes, fluorspar, lead, copper, coal, iron and other minerals, lime, limestone, etc. Directors: P. Gregory; P. W. Gregory. Registered office: Braeside, Cromford, nr. Matlock.

Chemical and Allied Stocks and Shares

STOCK markets, although firmer, were subdued in the absence of buying interest. British Funds remained little changed, but industrial shares, after earlier declines, were inclined to improve, and good features were not lacking, although movements generally were small and indefinite, Wall

Street and international uncertainties still being the dominating factors. Home railway stocks were better among the nationalisation groups, while there was further buying of colliery shares on break-up value estimates.

Chemical and kindred shares have been firm generally, partly owing to the news of big expansion schemes indicating confidence in the industry's future. Imperial Chemical were steady at 41s. 10½d. xd. The unchanged interim dividend was in accordance with expectations, but it had the effect of drawing attention to the fact that the yield offered compares favourably with the yields on many other leading industrial shares, and there are general expectations in the market that the total dividend for the year will be kept at the 8 per cent. which has ruled for a lengthy period. Fisons were 58s. 9d., B. Laporte 98s. 9d., Greeff-Chemicals Holdings 5s. ordinary changed hands around 12s. and Monsanto Chemicals 5½ per cent. preference were 25s. Considerable interest attached to Morgan Crucible issue of "A" ordinary £1 shares at 51s., which offered the public their first opportunity of acquiring an interest in the equity or ordinary shares of this well-known company.

Levers, following their recent rally, have come back to 52s. 3d. Turner & Newall were 82s., United Molasses 50s., Imperial Smelting 18s. 9d. and Amalgamated Metal 18s. 9d. The 4s. ordinary units of British Glues & Chemicals showed firmness at 16s., while in other directions, Low Temperature Carbonisation 2s. shares have further strengthened to 3s. 6d. on the progress statement. Among collieries, Bolsover moved higher at 61s. 6d., Powell Duffryn were 24s. 4½d., Sheepbridge 46s. 6d., Shipley 41s., and Horden Collieries 26s. 4½d. Iron and steels showed small indefinite movements, although Stewarts & Lloyds rallied to 50s. 9d. and Guest Keen to 41s. 9d., but United Steel eased to 25s. 3d. Thos. Firth & John Brown shares at 46s. 3d. xd. regained part of the decline, which followed the reduced interim dividend. Elsewhere, Dunlop Rubber were firmer at 70s. 3d., as were the units of the Distillers Co. at 130s. 6d. Goodlass Wall 10s. ordinary, after easing, rallied to 28s. 6d. and on hopes of a higher interim dividend, Pinchin Johnson strengthened to 44s. Textiles recorded small declines, Bleachers being 12s. 9d. and Bradford Dyers 23s., but Calico Printers rallied to 23s. 4½d. Courtaulds were 52s. 3d. and British Celanese 32s. 3d.

General Refractories have been steady at 19s., and British Match 46s. 6d. British Oxygen at 95s. regained part of an earlier decline. British Aluminium were 41s. 6d., but elsewhere, Nairn & Greenwich at 82s. 6d. and Barry & Staines at 52s. 6d. lost ground, although, as in many other instances, the lower prices were due mainly to the small buying interest in markets; selling generally has been on a limited scale, but with inactive conditions prevailing, it tended to have a disproportionate influence.

Boots Drug at 58s. 3d. rallied moderately after losing ground. Beechams deferred were 24s. 6d., Griffiths Hughes 59s., and Sangers 33s. Triplex Glass were a weak feature, these 10s. units falling from 40s. 3d. to 32s. 6d. following the halving of the dividend from 15 per cent. to 7½ per cent., but later recovered to 35s. before again receding, to 33s. Although at the last meeting the chairman pointed out the difficulties likely to be experienced owing to transition factors, the market had taken the hopeful view that it might be possible to maintain the dividend. Oil shares lost ground, Shell easing to 89s. 4½d. and Burmah Oil to 66s. 3d., while Attock Oil fell 3s. on the reduced dividend.

British Chemical Prices

Market Reports

MOST sections of the London general chemicals market report reasonably satisfactory trading conditions with no important change in the price position. Deliveries against contracts are proceeding along steady lines and a fair amount of new business has been in evidence. In the soda products section there is a good call for bicarbonate of soda, nitrate of soda and soda ash, while supplies of chlorate of soda and bichromate of soda are inadequate to meet present requirements in full. Hyposulphite of soda is firm and in steady request. There has been a steady pressure for supplies of yellow prussiate of potash and both carbonate of potash and permanganate of potash are receiving a steady inquiry. In other directions the lead oxides are in active demand and formaldehyde, arsenic and hydrogen peroxide are moving steadily. There has been little change in the coal-tar products market, supplies generally being well absorbed for some time ahead.

MANCHESTER.—Steady trading conditions have been reported on the Manchester chemical market during the past week. Deliveries under contract to the textile and other using trades in the district have been called for steadily, especially the full range of the alkali products, while a steady outlet for the potash, magnesia and ammonia compounds has also been reported. The mineral acids are meeting with a good demand. Inquiry from shippers during the week has been of fair extent and some additional business on export account has been reported. In the tar products section most lines are being called for in good quantities and a moderate weight of actual new buying has been a feature.

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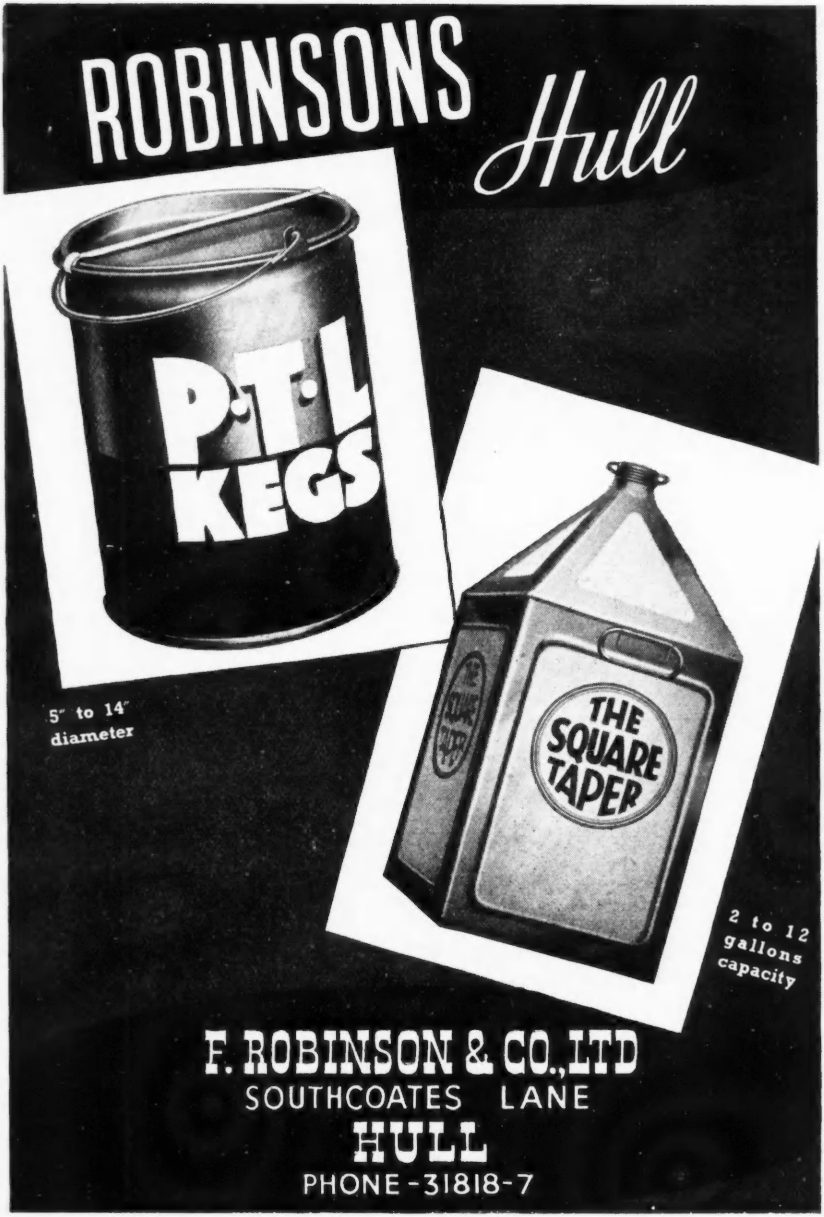
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Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

Applications for Patents

Carboxylic acids.—B. F. Goodrich. 26122.

Fatty acids.—L. Haskelberg. 25823.

Sulphonamide derivatives.—R. M. Hughes. (J. R. Geigy A.G.) 26351.

Dyestuffs.—E. R. H. Jones, K. J. Reed, and I.C.I., Ltd. 26128.

Conversion of organic substances.—Laboratoire de Recherches Industrielles. 25881.

Treatment of alloys.—Magnesium Elektron, Ltd., E. F. Emley, and A. C. Jessup. 25993-4.

Hydrocarbons.—Phillips Petroleum Co. 25782.

Fertilisers.—J. W. R. Rayner, J. H. Hudson, and I.C.I., Ltd. 25749.

Treatment of cellulosic material.—J. C. Seailles. 25874-5.

Calcium aluminates.—J. C. Séailles. 25876-7.

Phosphoruc products.—J. C. Séailles. 25878.

Recovering alumina.—J. C. Séailles. 25660.

Calcium aluminates.—J. C. Séailles. 26046-7.

Alumina.—J. C. Séailles, and Soc. des Ciments Français. 26052.

Synthetic hide.—J. Seraphim. 25771.

Plastic material.—J. Seraphim. 25772.

Artificial leather.—J. Seraphim. 25773.

Alumina.—Soc. des Ciments Français. 25661.

Alumina.—Soc. des Ciments Français. 25879, 26053.

Purification of penicillin.—H. Steiner, E. Zimkin, and Petrocarbon, Ltd. 25649.

Alloy steels.—C. Sykes, and Earl of Halsbury. 26030.

Utilising atomic energy.—A. Vaugeau, and J. Le Michel. 26173.

Complete Specifications Open to Public Inspection

Separation and concentration of diolefins.—Standard Oil Development Co. July 22, 1942. 8709/43.

Preparation of 5-amino-acridines from diphenylamine-2-carboxylic acids.—Sterling Drug Inc. March 3, 1945. 5439/46.

Production of powders having a base of phenols, substituted or not, and products obtained thereby.—G. Truffaut, and I. Pastac. June 9, 1943. 23625/46.

Unsaturated polymeric materials.—United States Rubber Co. March 1, 1945. 898/46.

Treating bauxite and particularly silica and iron containing bauxite.—I. de Vecchis, and O. Ramuz. March 2, 45. 6458/46.

Production of antibiotic substances.—Winthrop Chemical Co., Inc. March 3, 1945. 5440/46.

Heat exchangers for heating viscous liquids.—Babcock & Wilcox, Ltd. Dec. 19, 1939. 24418/46.

Resinous compositions.—Bakelite Corporation. March 7, 1945. 7026/46.

Adhesive bonding of surfaces or in relation to adhesive compositions suitable for use therein. March 9, 1945. 6960/46.

Gas separation process.—Carbide & Carbon Chemicals Corporation. March 6, 1945. 4751/46.

Protective layers obtained upon aluminium or its alloys.—Compagnie de Produits Chimiques et Electro-Metallurgiques Alais, Froges et Camargue. Nov. 9, 1943. 28063/45.

Manufacture of polymers.—E.I. Du Pont de Nemours & Co. March 6, 1945. 7008/46.

Synthetic linear polyamides.—E.I. Du Pont de Nemours & Co. March 6, 1945. 7009/46.

Manufacture of polymers.—E.I. Du Pont de Nemours & Co. March 6, 1945. 7010/46.

Synthetic linear polymers.—E.I. Du Pont de Nemours & Co. March 6, 1945. 7011/46.

Preparation of para-tertiary amino aromatic aldehydes.—E.I. Du Pont de Nemours & Co. March 9, 1945. 7263/46.

Manufacture of cyanhydrins.—E.I. Du Pont de Nemours & Co. March 9, 1945. 7278/46.

Soft solders for aluminium and its alloys.—H. Grunauer. March 9, 1945. 7485/46.

Process of providing magnesium and its alloys with a protective surface coating against corrosion.—K. G. Haag, and A. U. Trägardh. Dec. 15, 1943. 24239/46.

Anodic polishing methods for metals and alloys.—R. E. Halut. March 5, 1945. (Cognate application 6827/46.) 6826/46.

Interpolymers of ethylene and organic vinyl esters.—I.C.I., Ltd. June 6, 1942. 9091/43.

Polymerisation and copolymerisation of acrylonitrile.—I.C.I., Ltd. Aug. 2, 1943. 14729/44.

Production of vitamin preparations.—Jiri Schicht Akcova Spolenost. Oct. 20, 1941. 23681/46.

Cellulose derivatives. Mo och Domsjö Aktiebolag. March 9, 1945. 7337/46.

Water-resistant characteristics of resins and resinous articles and resinous products resulting therefrom.—Norton Grinding Wheel Co., Ltd. Sept. 28, 1942. 15768/43.

Method of producing ammonia from hydrogen and nitrogen.—Odelhog, S.-O. March 8, 1945. 8389/46.

Preparation of phenthiazone derivatives. —Soc. des Usines Chimiques Rhône-Poulenc. March 5, 1945. (Cognate application 5083/46.) 5082/46.

Apparatus for rectifying in continuous operation under vacuum raw phenols and other mixtures of homologous compounds.—Soc. pour l'Exploitation des Procédés Ab-der-Halden. April 24, 1942. 28172/45.

Organo-silicon compounds.—Westinghouse Electric International Co. March 9, 1945. 7307-10/46.

Hydrocarbon material.—P. J. Wilson. March 10, 1945. 9628/46.

Complete Specifications Accepted

Production of styrene and its homologues by dehydrogenation.—Distillers Co., Ltd., H. M. Stanley, F. E. Salt, and T. Weir. Feb. 15, 1943. 580,088.

Process for the plasticisation of rubber.—Dunlop Rubber Co., Ltd., D. F. Twiss, and F. A. Jones. June 24, 1943. 580,247.

Water-resistance of shaped articles comprising polyvinyl alcohol.—E.I. Du Pont de Nemours & Co. June 18, 1943. 580,206.

Coating compositions.—E.I. Du Pont de Nemours & Co. March 20, 1943. 580,258.

Thermosetting plastic compositions comprising polyvinyl acetal and ketal resins.—E.I. Du Pont de Nemours & Co. June 5, 1943. 580,275.

Production of synthetic resin compositions of improved physical and chemical properties.—W. E. F. Gates, and I.C.I., Ltd. Dec. 22. 1943. 580,250.

Resinous condensation product and method of making same.—General Tire & Rubber Co. Feb. 17, 1943. 580,184.

Preparation of β β' β''-trichlor-α α' bis 4-chlorphenylethane or *pp'*-dichlordiphenyl-trichlorethane.—G. W. Gladden, and W. W. Cocker. June 21, 1944. 580,224.

Process for the production of chromic hydroxide.—W. Glaser. Dec. 6, 1943. 580,181.

Sulphur-containing compounds or compositions and methods of making the same.—H. W. K. Jennings. (Wilmington Chemical Corporation.) June 15, 1944. 580,189.

Process for the preparation of α-nitro-isobutene.—A. E. W. Smith, C. W. Scaife, and I.C.I., Ltd. March 13, 1944. 580,256.

Manufacture of organic nitro compounds. —A. E. W. Smith, C. W. Scaife, H. Baldock, and I.C.I., Ltd. April 3, 1944. 580,260.

Manufacture of monoazo-dyestuffs.—Soc. of Chemical Industry in Basle. Oct. 12, 1942. 580,092.

Process for producing fast dyeings on cellulose fibres.—Soc. of Chemical Industry in Basle. March 18, 1942. 580,174.

Manufacture of dyestuffs.—Soc. of Chemical Industry in Basle. April 2, 1942. 580,175.

Process for the catalytic conversion of hydrocarbon oils.—Standard Oil Development Co. Jan. 31, 1942. 580,087.

Manufacture of modified synthetic resins. —W. Walker & Sons, Ltd., J. R. Alexander, D. Burton, and F. Hausmann. April 12, 1943. 580,120.

Production of fluorinated organic compounds.—W. B. Whalley, and I.C.I., Ltd. May 26, 1944. 580,140.

Manufacture of polyazo dyestuffs.—Williams (Hounslow), Ltd., and H. Ackroyd. March 31, 1944. 580,122.

Anti-coagulant bis (4-hydroxy) coumarine and process for making the same.—Wisconsin Alumni Research Foundation. Oct. 11, 1941. 580,084.

Manufacture of aldehydes.—British Celanese, Ltd. June 12, 1943. 580,383.

Saponification for cellulose ester materials.—British Celanese, Ltd. July 15, 1943. 580,433

Synthetic resinous condensation products British Thomson-Houston Co., Ltd. March 26, 1942. 580,405.

Manufacture of *N*-acylthiomethyl carbonamides.—E.I. Du Pont de Nemours & Co. March 1, 1944. 580,357.

Manufacture of solid and semi-solid polymers from aliphatic mono-olefines.—E.I. Du Pont de Nemours & Co. Dec. 3, 1942. 580,416.

Manufacture of copper mercaptides.—E.I. Du Pont de Nemours & Co., and A. L. Fox. Nov. 8, 1943. 580,366.

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